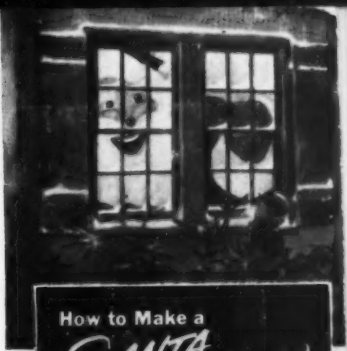
POPULAR SCIENCE

TECHNOLOGY DEPT. #6

MONTHLY

MECHANICS - AUTOS - HOMEBUILDING

25¢ December



How to Make a SANTA WINDOW Page 163

DEC 1 1952
DETROIT

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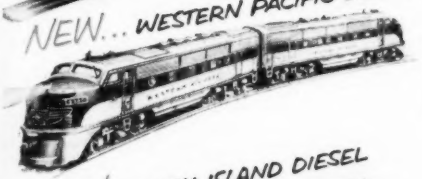

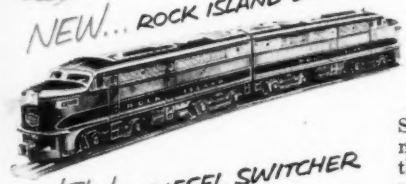

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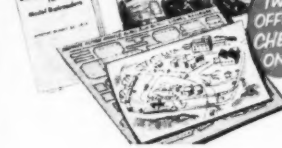

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Founded 1872, Vol. 161: No. 6

POPULAR SCIENCE REG. U.S. PAT. OFF. *Monthly*

Mechanics and Handicraft REG. U.S. PAT. OFF.

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DECEMBER, 1952

This Month's Big Features:

[redacted] (slug), *n.* A piston.
soup (sōōp), *v.t.* To rework an er give it more horsepower, sometimes adding power-boosting accessories. expressed as "soup up."
stack (stăk), *n.* A short pipe used exhaust gases away from an indiv inder. Short pipes used on carb takes also are frequently called st
stick (stĭk), *n.* A camshaft.
stick a foot in the pot. To throttle wide. The phrase might l way: "He stuck his foot in th herded his goat to the head of He'd 'a pruned the field if he ha out in the turn." This means: the throttle wide and drove his lead. He would have won if hi had not failed in the turn."
stick shift (stĭk shift), *n.* Us a car with a steering-column lever, as differentiated from

***A hot-rod dictionary** has been on our list of 10-most-needed literary works for a long time. This month the job is complete. If hot-rod words are Hindustani to you, see page 185 for the definitions—and you'll soon have a hot-rodder's gift of gab.*

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Picture yourself going places

You've done it often. Call it day-dreaming if you like, but you've seen yourself in a bigger job — giving orders and making decisions — driving off in a smart new car — buying your family a fine home.

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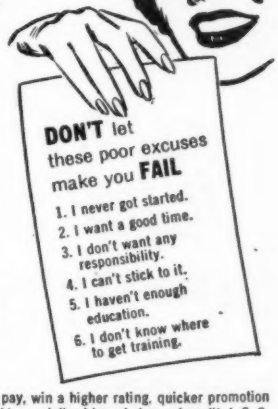

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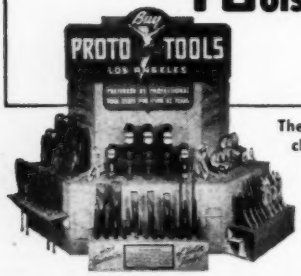

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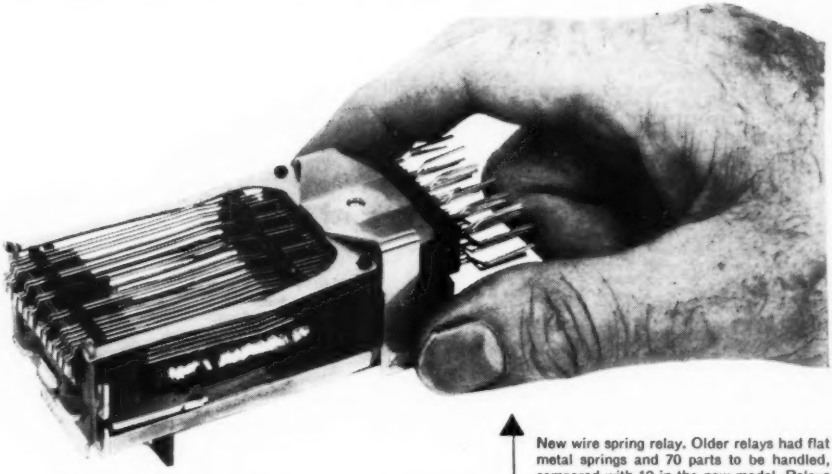
COMING NEXT DECEMBER . . .

More Christmas Ideas

Do you plan to build a Christmas display for your home like those on pages 163 to 167? Do you have plans for special exterior lighting effects or for interior Christmas-tree or Nativity arrangements? If so, unlimber your camera and shoot some pix. Then write a one-page description of your holiday display and send it along with the pictures to Christmas Editor, POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York 10, N. Y. We will pay $25 for each such letter accepted for publication next year. Material cannot be returned unless accompanied by a stamped, self-addressed envelope.

It splits seconds even faster

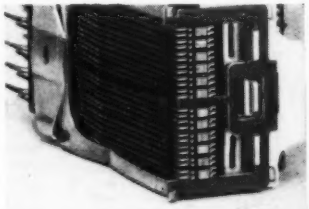


New wire spring relay. Older relays had flat metal springs and 70 parts to be handled, compared with 12 in the new model. Relays operate by means of an electromagnet which responds to high-speed pulses.

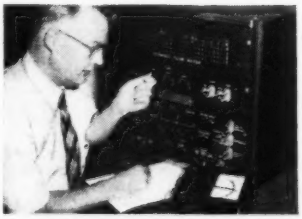
In a split second, relays, which are high-speed switches, set up dial telephone connections. Then they are off to direct the next call. Yet even this speed is too slow for Bell Laboratories scientists in quest of still faster switching.

Scientists and engineers devised a new relay – the wire spring relay – and worked out the production problem with Western Electric, manufacturing unit of the Bell System. This is twice as fast, uses less power and costs less to make and maintain.

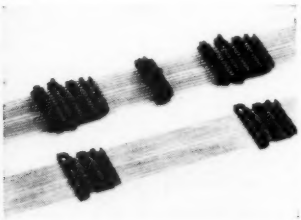
With speedier relays, switching can be done with less equipment . . . and calls go through faster. The wire spring relay is a practical example of how Bell Telephone Laboratories and Western Electric pool their skills to improve telephone service while keeping its cost down.



New relays must be able to operate one billion times—equal to once-a-second for 30 years. Employing a sound recorder as a precision vibrator, Bell scientists learned to evaluate the effect of sideways motion on relay life. Such rubbing motion is limited to one-thousandth of an inch in the new relays.



Dynamic Fluxmeter, developed by Bell Telephone Laboratories, indicates flux build-up in intervals of 25 millionths of a second. Precise information like this was essential to higher speed operation.



Relay springs as they come from Western Electric molding machine, before being cut apart for use. Molding technique saves time and money . . . makes possible the maintenance of relays in precision adjustment.

Bell Telephone Laboratories

Improving telephone service for America provides careers for creative men in scientific and technical fields.

Now You Can Get 41 Miles A Gallon from Your Car!

By Raymond J. Carpenter

IN 1948 SOME OF THE NATION'S TOP EXPERTS ON AUTO ECONOMY AND EFFICIENCY GATHERED TO PROVE ONCE AND FOR ALL *THE TRUE CAPABILITIES OF THE AMERICAN AUTOMOBILE.* After five months of testing and experimentation these men proved that any car, regardless of make or age and with only minor adjustments, can get from 35 to 45 miles per gallon of gas . . . and can run up to 15,000 miles without an oil change.

I am already benefiting from the facts these experts uncovered. If your car is less than 15 years old, *read this story carefully* for information on how you can get 2 to 9 more miles per gallon of regular gas. Learn how to . . . boost horsepower up to 30% . . . increase top speed up to 32 more miles per hour . . . get 30,000 miles from your tires . . . zoom from 0 to 60 miles per hour in 12 seconds.

These Facts Are the Key to Top Performance

All experiments conducted by these automotive economy experts were made on *average* cars like yours and mine, and under *average* conditions. No changes or adjustments were permitted that you couldn't make with the tools in your own or your mechanic's garage. Fuel experts attending the meet worked out money saving fuel mixtures and carburetion hints . . . some of which are revealed in this article.

Where Your Gas. Really Goes!

These engineers discovered that as much as 80c out of every gasoline dollar you spend is WASTED. They proved that up to 30% of generated engine power doesn't move your car one inch . . . it only serves to overcome engine friction. As much as 20% is lost as it blows out your exhaust pipe. Another 30% operates your engine's cooling and ignition systems.

If you know these facts and know how to apply a few simple economy secrets, you can DOUBLE THE PRESENT MILEAGE AND POWER of your car.

What You Can Do About This

The following inexpensive items can greatly reduce engine friction and improve combustion and carburetion efficiency of any car.

1. A new molybdenum oil additive (Auto-Moly) will reduce engine friction and wear as much as 66%.
2. A low cost, imported compression sealant will stop compression-power leaks in one application.
3. An air bleed carburetor adjustment needle will improve air-gas mixture . . . guaranteeing better combustion and gas economy.

"I'm a fast driver and my tires never lasted long . . . your "common sense" tire tips have saved me nearly $100 this year." — Karl Keeler

Tested Theories Give Results!

A few simple theories developed at the grueling yearly mileage meets, can help you get up to 5 more miles per gallon:

1. *Buy your Gas at night* or early in the morning before the sun's heat expands the gas in station tanks. Save 2% to 4%!
2. *Don't drive* with a near-empty gas tank . . . fuel vaporizes and escapes through the air vent.
3. *Drive slowly* the first few blocks after starting. A cold engine uses twice as much gasoline.

"I'm a salesman and drive hundreds of miles every week. Believe me, it means a lot to get 29 miles per gallon. —J. Tobin

"OPEN SESAME" TO A 66% CUT IN CAR EXPENSES

I've mentioned just a few of the hundreds of money saving tips developed and proved by these automotive engineers and world famous speed champs. *You* can now benefit from their knowledge and experience. *Learn how to:* Use one oil filter element for a lifetime . . . Use an inexpensive solvent to dissolve all carbon and reduce oil waste . . . Save up to $300 when selling your used car . . . Convert your car to a 150 m.p.h. sports car . . . Get "High Test" performance from *regular* gas . . . Easily double your braking power! DON'T PAY FOR NEEDLESS REPAIRS . . . "Fix It Yourself" and save at least $100 this year. *Learn how to:* Determine FAIR repair charges . . . Fix your leaky radiator and save $15 . . . "bump out" fender dents and save up to $35.

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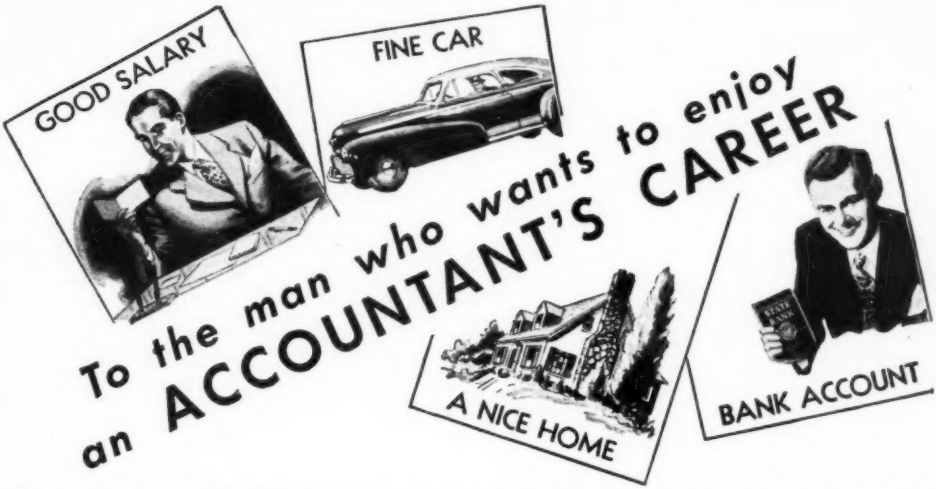

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Letters

When the Left-Hand Drive Started

Pictures with your recent articles on antique cars suggest that most, if not all, American automobiles built before 1910 had the steering wheel on the right-hand side. Is this true? And, if so, did Americans in those days drive on the left side of the road, as the British still do?

PETER STEINHOBEL,
Eagles Crag, Union of South Africa.

The first U.S.-made cars, apparently in imitation of European models, were built with right-hand drive—even though traffic in this country, from the earliest horse-and-wagon days, has always kept to the right. In 1908 Henry Ford, recognizing the advantage of placing the driver where he could get a straighter and closer look at oncoming traffic, gave the first Model T a left-hand drive. By 1913 and '14 his competitors were all switching over.

How to Make a Cabin Howl

My heart aches for PSM reader Hugh F. Kirkwood [Letters, Oct. p. 20] who built a cabin in the woods and then couldn't get the wind to howl around it properly. I had the same problem a few years ago when I had a

camp in a place called Skunks Misery near Augusta, Me. Solved it by placing several glass jugs just under the cabin, on the windward side, and boring some holes through the sill so the wind could blow across the tops of the jugs. Just one jug won't do it, but six of different sizes produce a very decent shriek.

JOHN STERLING, Sanford, Fla.

Seemed Like a Good Idea

There's nothing really new under the sun, as witness the note about self-lighting cigarettes in the PS News & Notes page of your October issue.

Back in 1930 a similar cigarette was marketed in this area: The tip had a thin band of composition similar to the head of a safety match; the package had a safety striking surface.

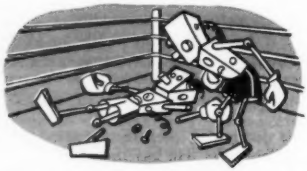
Scrape the tip on the striking surface and you had a light all right; but the first few drags tasted terrible. It didn't stay on the market long.

JOHN B. NEWLIN, Crawfordsville, Ind.

Science Vs. Sportsmanship

Re: "Mechanical Sports Are Coming." Oct., p. 97—

When such devices take the place of



humans, then where is the sportsmanship?

So why stop with robot officials—why not robot players?

EDWARD MURRA JR., Ironwood, Mich.

In Defense of MGs

Wilbur Shaw writes about the MG [Sept., p. 155] as if he doesn't consider it quite dignified to drive one. I too was a little concerned about joining the MG club, because I am past 50. But when I see a retired Army Officer of 65 accepting a "drag" invitation from a 22-year-old sergeant; when an Army nurse—a captain—finishes third in a sponsored MG dirt-track race; when a college student complains that his parents bought him an MG but consistently leave him their big car—then I feel I am not out of place.

GENE BROWN, San Antonio.

Why do a lot of guys love the MG? Some people like spinach, and some don't. I like spinach—and MGs as well. And perhaps

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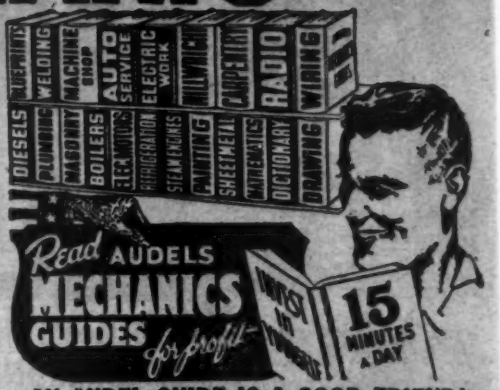

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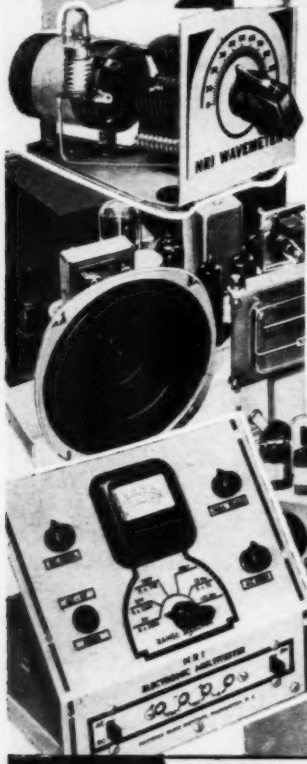

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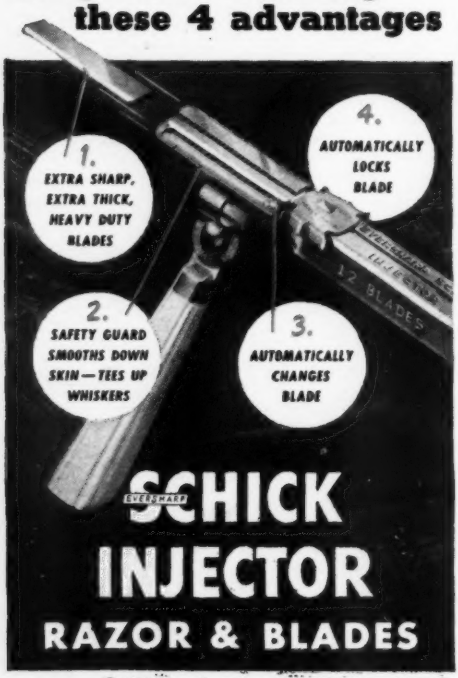

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there's a negative reason: A lot of guys, myself included, are fed up with the gaudy behemoths that Detroit is foisting on the public and, as a rejection, are buying a neat, small, practical, efficient package, which the MG is.

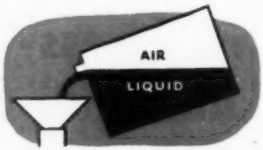
RALPH DAVENPORT, Sidney, N. Y.

How to Pour Antifreeze

You certainly fumbled that procedure for pouring antifreeze [Oct., p. 199]. I just wouldn't want to be around if the mechanic dribbled alcohol on the manifold. It's explosive—remember?

E. W. FREDRICKSON, Bridgeport, Conn.

Do it this way. Instead of having the



spout at the bottom, turn it to the top. The antifreeze won't dribble.

C. L. BOSSMEYER, Rockford, Ill.

Imported Ideas?

I read with interest the piece on the development of the motorcycle in your October issue [p. 172]. It is quite true that the Harley-Davidson folks have got a good bike in the model K. But it makes me laugh to see its features heralded as the latest thing. In truth, every feature has been tested and proved through years of use in British and German machines.

The four-speed foot shift has been in use from 'way-back-when . . .

J. ROGER TALBOT, Port Credit, Ont.

We're looking forward to a communique from Moscow about this. The Russians will undoubtedly insist that they built the first motorcycle and were responsible for every improvement made since then.

In your article on the Harley-Davidson I spotted a mistake. A caption on page 175 says the "open crankcase shows . . . four-speed transmission." This is actually the timing case, the gears exposed being the camshaft gears.

DAVID LACCIA, Philadelphia.

You're right, of course; and, since we knew better, we can only plead carelessness.

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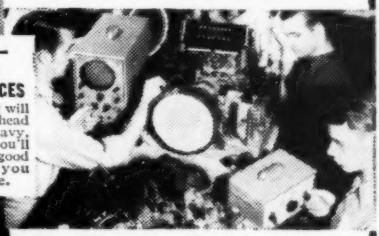

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Hot Exhaust

Will you please inform me as to the approximate temperature of the exhaust from an automobile when the motor is idling and when operating at high speed.

R. F. Winters, Covington, Ky.

We passed this question to the Chrysler engineering division, which says:

"In a recent laboratory test, the temperature at the heads of the exhaust valves averaged 500° F. during idle operation at 500 r.p.m. At 3,000 r.p.m., under full load, the average temperature was 1,400°."

Wrong-Way Weather Vane

In a recent Popular Science you carried an article about a weather vane on top of a TV antenna. It's a good idea to leave off the compass directions if you have a rotatable antenna. Rotating the antenna would throw someone off course.

Down here we get two stations in Boston and one in Providence, R. I., and to get really good reception you need this kind of antenna.

Albert G. Brock, Nantucket, Mass.

Rugged Arresters

How can I tell whether a lightning arrester is working properly after years of exposure? The bolts are corroded . . .

E. H. Swartley, Alpine, Tenn.

Underwriters Laboratories says it would cost far more to test an individual arrester than to buy a new one. Very high voltages are needed for a proper test on most types.

If an arrester is cracked or broken, you should replace it. But approved arresters are made and tested for long service out of doors, so age alone needn't worry you. Neither should corrosion on the outside of the terminals.

How Big Are Tires?

Just for the heck of it, I put a big pair of calipers to a 6.50-16 tire the other day. Imagine my surprise when the calipers showed a cross-section diameter much greater than 6.50 inches. Was the tire mis-marked?

John Sikorsky, Chicago

The section diameter of most tires is a little more than the designated size: 6.50 actually measures 6.8 in. In the new low-pressure tires, however, size designation is a true indication of section diameter.

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

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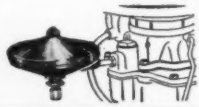

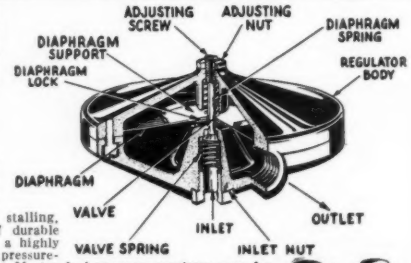

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The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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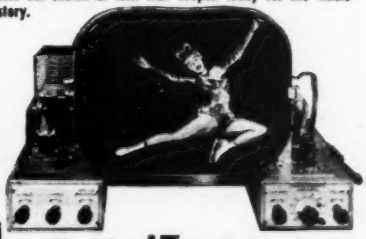

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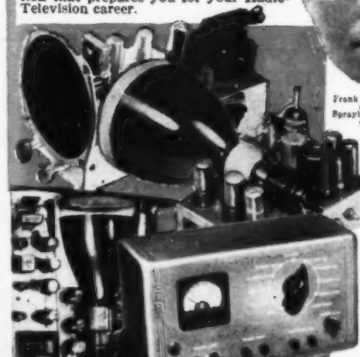

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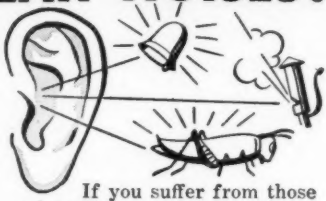

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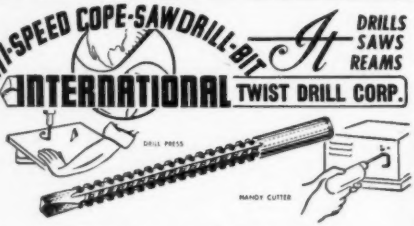

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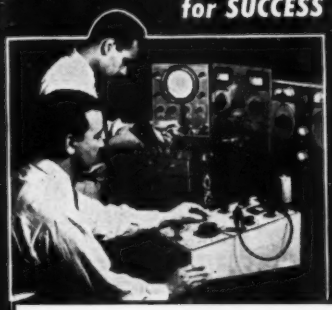

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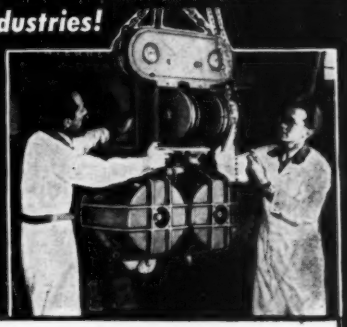

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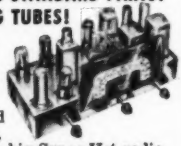

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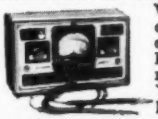

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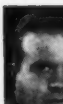

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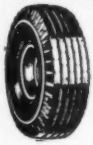

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700-16	6.45	760-15	6.05	750-15	13.95	900-20	17.25
750-16	9.25	800-15	6.55	825-15	12.95	1000-20	17.75
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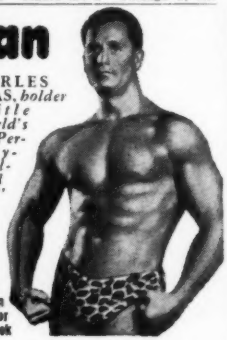

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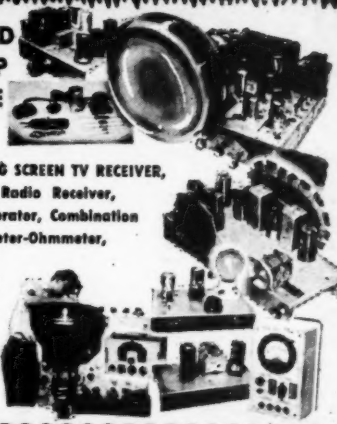

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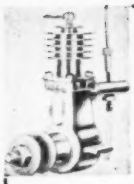

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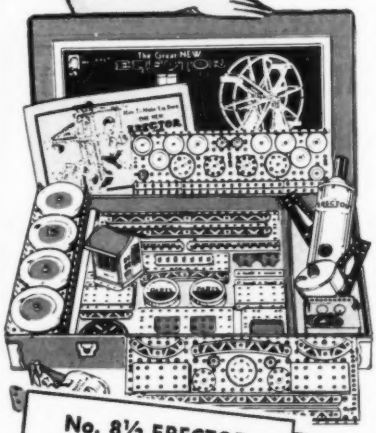

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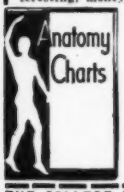

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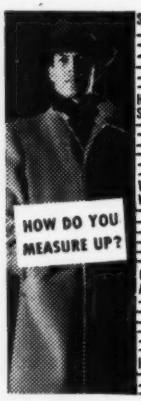

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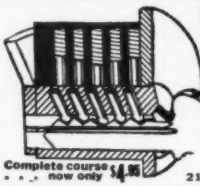

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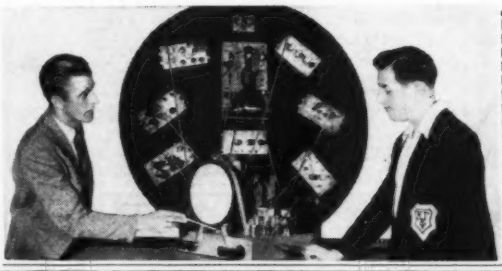

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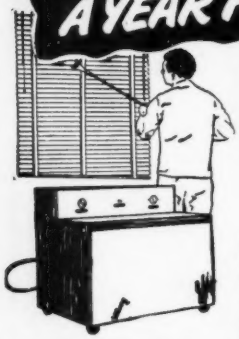

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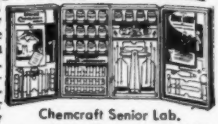

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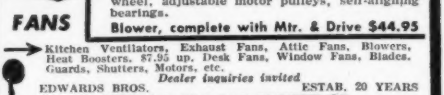

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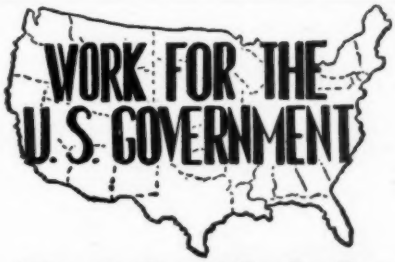

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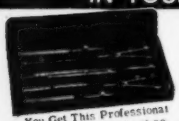

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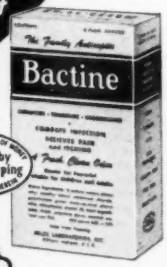

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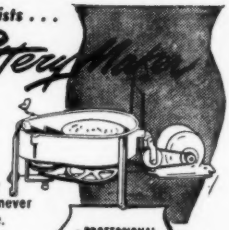

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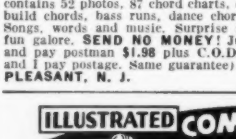

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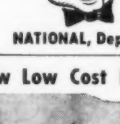

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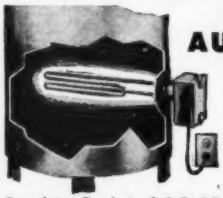

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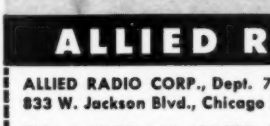

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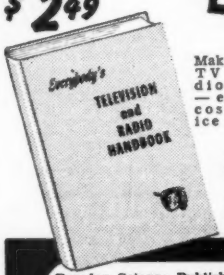

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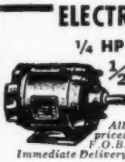

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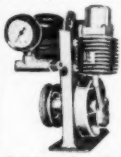

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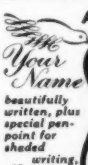

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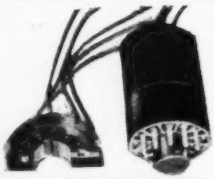

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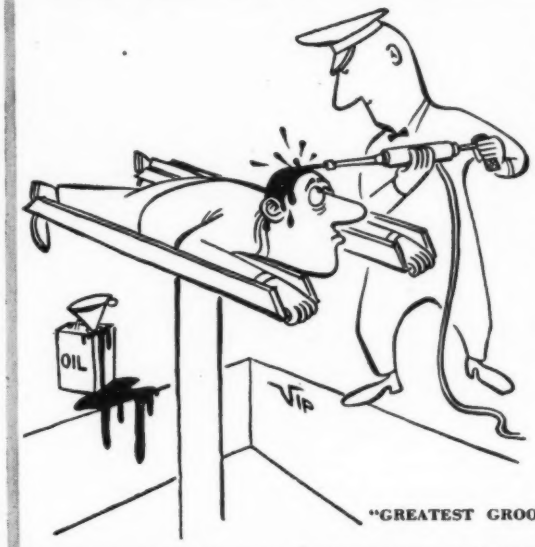

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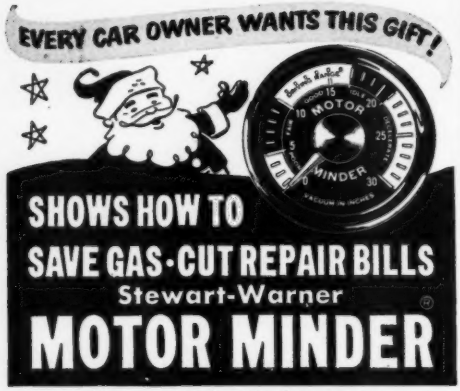

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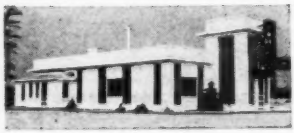

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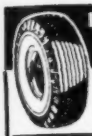

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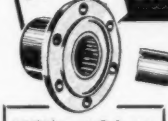

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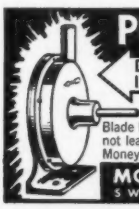

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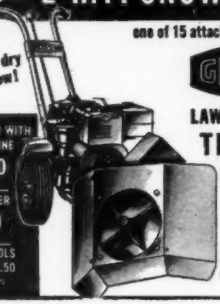

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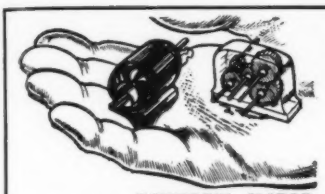

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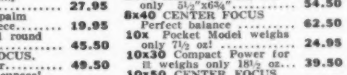

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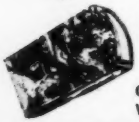

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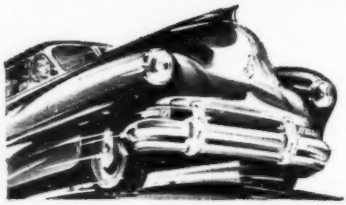

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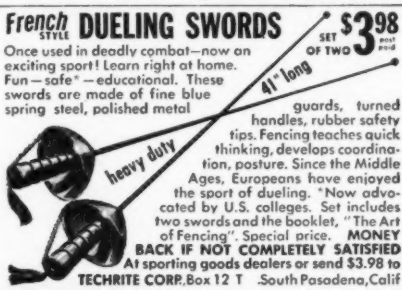

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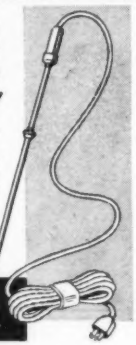

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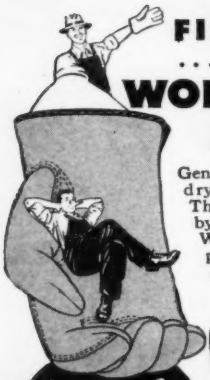

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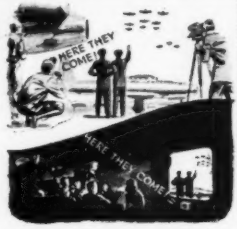

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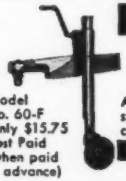

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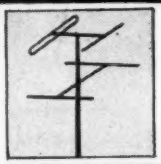

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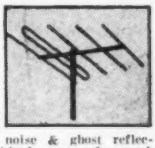

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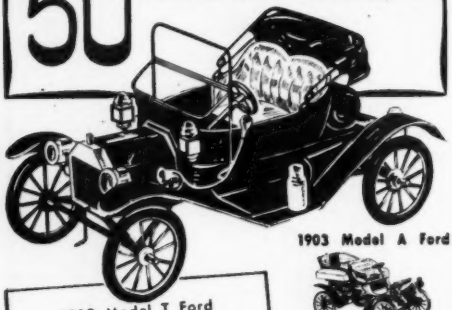

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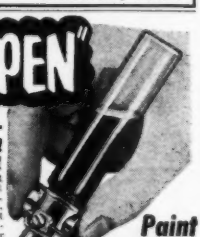

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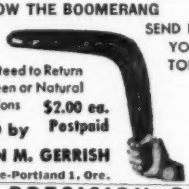

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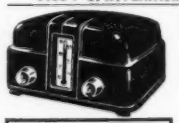

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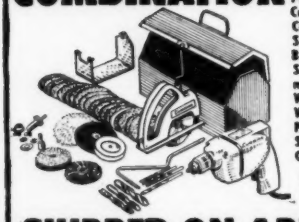

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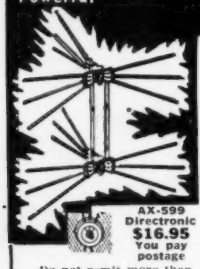

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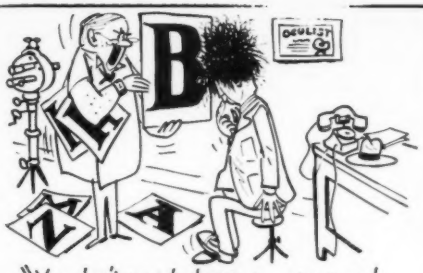

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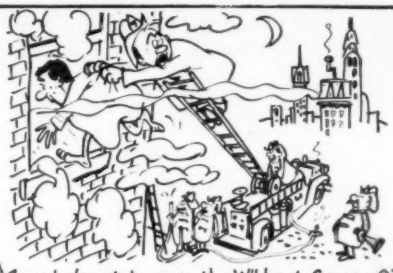

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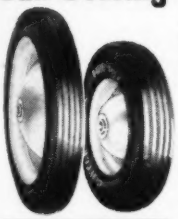

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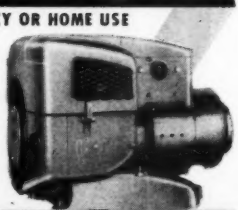

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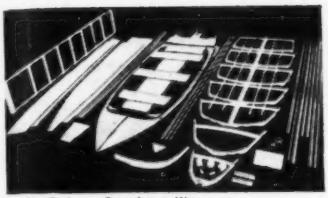

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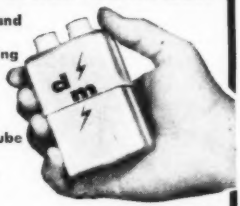

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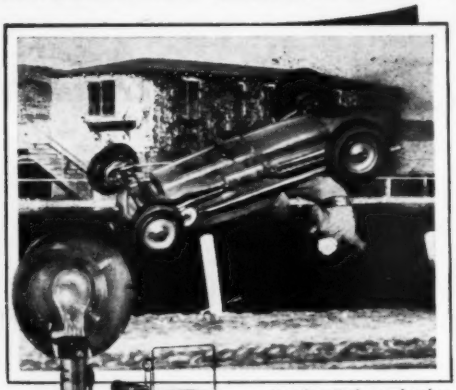

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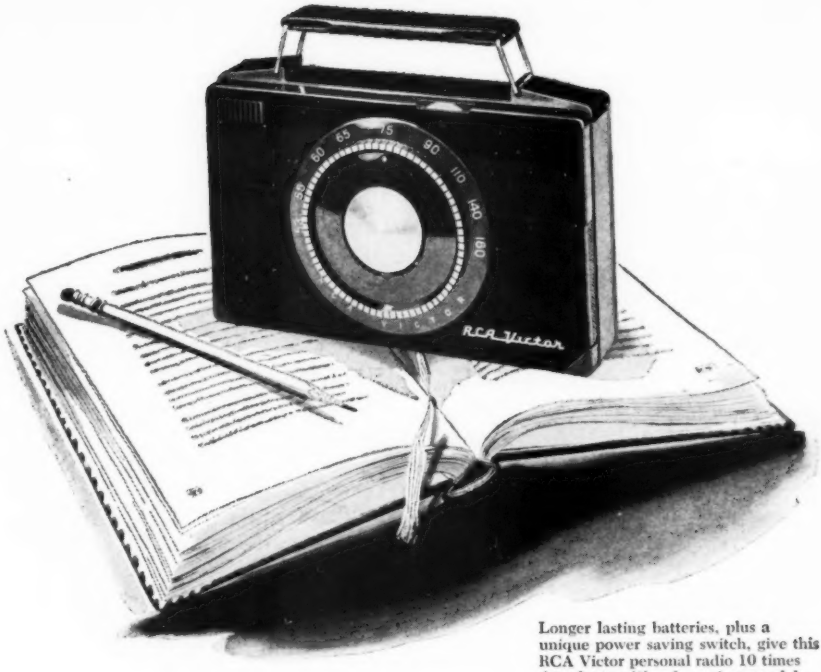

Longer lasting batteries, plus a unique power saving switch, give this RCA Victor personal radio 10 times the playing life of previous models.

New Personal Radio...plays 10 times longer

Just about the size of the average book, this new Personal radio—developed through RCA research and engineering—offers new performance, convenience and economy to those who want a light, beautifully streamlined, long-lasting instrument.

Secret of its long life is a new dry cell "B" battery—used in combination with redesigned "A" batteries to create a more lasting power source. Additional life is given by a unique switch, for use in areas where reception is strong, which lets the batteries rest, and adds up to 30% to their lives. RCA Victor's new receiver plays *instantly,* without warm-up, has an automatic control to keep the sound volume even, and can be had in six rich colors.

Development of this compact radio is another example of RCA research and engineering at work for *you.* RCA research means better quality and performance from any product or service of RCA and RCA Victor.

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POPULAR SCIENCE
REG. U. S. PAT. OFF. Monthly

Tightly guarded, unglamorous 80-mile-an-hour No. 14 makes sure that last-minute Christmas cards arrive on time.

By Henry B. Comstock

THE little man with the big handful of Christmas cards looked worried. He was 20 feet from the letter box marked "Via 20th Century Limited" when a postal clerk dumped the last of a mountain of brightly colored mail into a can-

No. 14 isn't a handsome train by 20th Century Limited standards. But her storage cars and railway post offices are exclusive; New York Central train crew can't even ride them.

"MUD," or unworked mail, is spread out on the pouch table. Special-delivery parcel post goes into the open-mouthed pouches; letter packages, to the pigeonhole crew.

vas pouch and relocked the empty box.

"Hey, wait for these," yelled the latecomer. "If they don't make the Century . . ." His voice trailed off.

The clerk grinned and stuffed the cards into the bulging pouch. Then he turned to me, winked—and told me a little inside story that is a neat sample of the ingenuity which the Post Office devotes to speeding delivery not only of Christmas cards but of everyday mail.

"Fact is," he revealed, "this stuff isn't going east on the Century at all. In another half-hour it will be out of town on the hottest mail train in the United States. That's Number 14, due in New York at 6:30 a.m. tomorrow—three hours before the plush and varnish.

"If we marked this box 'New York Mail' nobody would stop to read it and half the letters going into it would be addressed to Omaha. But everybody knows the Century, where it runs and how fast it gets there. So they figure they are giving themselves a break every time they flip an eastbound letter in the slot. Which is okay with us, because they're right."

To learn more about Train No. 14, I went to see District Superintendent M. R. Clarke in the Chicago office of the Postal Transportation Service.

EIGHT MAIL STORAGE CARS

"That clerk wasn't fooling," Clarke said. "Number 14 is the heaviest and busiest of all the 7,666 mail trains in regular daily service in the country. Normally it takes a crew of 47 clerks to work her first-class mail and special-delivery parcel post. But right now, of course, we're doubling up on our regular crews, and using additional men. You want to make a run with them?"

No Day for "Flypaper"

I most certainly did, and three days later I was streaking through a sleet storm aboard the hottest job on the "Chic"—railway Post Office slang for the New York-Chicago route.

"No day for flypaper," cracked a clerk, as he upended a heavy pouch, tumbling a couple of thousand letters onto a table.

"Flypaper," I judged, was air mail; these fellows talk their own lingo.

Before I could ask, a sharp reverse curve had every man on the train grabbing for the guard rails. But the car leveled off with a final lunge, and two seconds later they were all back at work, tossing the first-class stuff into the maze of pigeonholes on the walls.

Back on my own two feet, I said: "Guess you don't think much of Christmas mail."

The dumper shrugged.

"It's good for overtime."

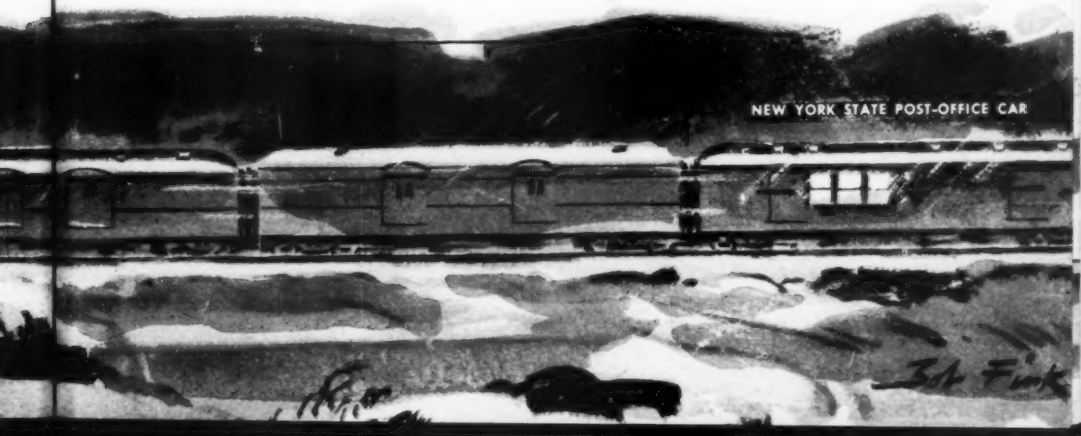
Halfway down the brightly lighted car a stocky young sub laid one hand on the short-barreled .38-caliber revolver which every Postal Transportation clerk carries, and rasped to nobody special:

"All the same, I'd like to use this on the guy who dreamed up cards that measure over 4½ inches wide."

NEWSPAPER SACKS are piled to the ceiling in a storage car. New Yorkers are always hungry for home-town news, and every daily paper west of Chicago contributes to No. 14's cargo.

I saw what he meant. Already he had accumulated a heap of envelopes too large to fit the pigeonholes.

There was nothing handsome about No. 14, inside or out. I had been told



that she was the lineal descendant of the original "Fast Mail," established in 1875, to furnish 30-hour postal service between New York and Chicago. Perhaps you have seen lithographs of the original flier, a fabulous little train of four white postal cars, each trimmed with cream and gold, and bearing the embossed Great Seal of the United States on either flank, set off by handpainted landscapes.

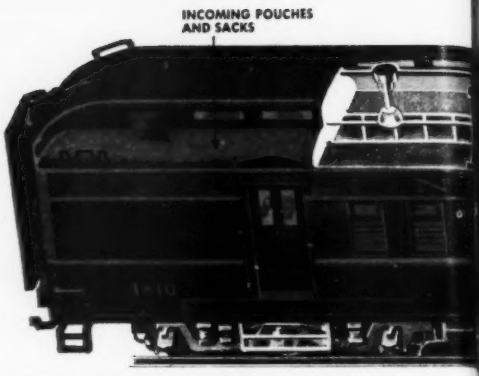
But No. 14 had the silhouette of a sawtooth file. A huge Niagara-type engine had been assigned to the head end; its 6,000 horsepower would be needed to smash an 80-mile-an-hour swath through the sleet. Behind the bulking tender were nine mail-storage jobs and three Railway Post Office cars. Crowning the string was an aging New York Central combine coach for the train crew.

Mail Funnels to Chicago

Uncle Sam pays the New York Central 56 cents a mile for the use of these big 60-footers, which cost $70,000 per unit. The Central's job is to get them over the road, but how the Postal Transportation Service conducts its business aboard them is strictly its own affair.

The business had started at 7:00 in the morning, when a switcher eased the 13-car train onto Track 13. Out on the platform a fleet of trucks, groaning under the weight of thousands of "balloons," or heavily loaded letter pouches and paper sacks, was already standing by.

Practically none of this mail had originated in Chicago. It had come from



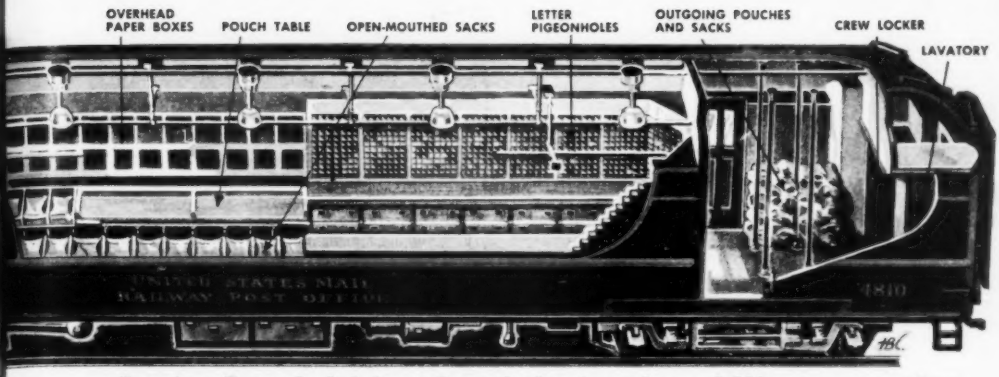
Standardized design of RPO cars simplifies

fast-mail connections extending in a great arc from New Orleans to San Francisco. Seattle and Duluth. Other RPO clerks had already labeled these mail bags.

Now it was up to the crew on No. 14 to break down the contents of the pouches and sacks into hundreds of subclassifications. The 57 clerks would be expected to handle more than 800 pouches and 400 paper sacks between Chicago and Cleveland, and before the train had made its unceremonious departure at 10:30 a.m., a good third of the job was in the bag, according to E. F. Lavis, acting foreman of the flier.

Lavis, who stands six feet four and bears a striking resemblance to Abe Lincoln, was responsible for filling out the innumerable forms which give the Service a complete work report at the end of each run, down to the last loose nickel found in the bottom of an incoming pouch.

"Had a funny experience with a 50-



mail sorting. But each clerk has to know the locations of some 1,200 eastern post offices.

cent piece years ago," he told me, as he placed a penny in a folding paper cup and carefully labeled it. "Because my hands were full of letters at the time, I stuffed the half-dollar in a pocket and never thought of it again until some time later. Then I dug out what I thought was the same 50-cent piece and gave it to the Clerk in Charge, for forwarding to the Cleveland Office. About a week later I got a red-hot letter from the big boss. He told me that the next time I turned in half a buck it had better be the exact one I had found. I figure the original coin had been planted as a test."

Deft Fingers Work Like Machine

In addition to his paper work, Lavis was "working a case," just like any other clerk.

"You might say this is the backbone of our operation," he said. "As you've already seen, these three RPO cars are laid out almost exactly alike.

"It's the business of the pouch clerk down at that table to sort the stuff which the dumper spills out. He shoots the special-delivery parcel post into the right open pouches, and distributes the packages of letters among the clerks at this end of the car. We break open the packages and work the letters into the right pigeonholes. Then, when one of them is full—that takes about 50 letters—we empty it and tie the contents up like this."

As he spoke he dug his fingers into one of the small compartments and slipped out an assortment of plain and fancy envelopes. Working with the speed of a mechanical binder, he whirled a length of jute around them twice in each direction, then tied a double hitch with a release loop. A final snap of the twine and he had another "tie-out" package ready for a receiving pouch.

To hear Lavis tell it, this mail-classifying job was as simple as the "Travel for Uncle Sam" advertisements. But he had left out one important detail. That

[*Continued on page 274*]

Air Douses Oil Fire

INSTEAD of fanning flames, air quells them in a new way to put out fires in oil tanks.

It consists of injecting air under slight (six-pound) pressure at the bottom of a tank of burning oil through a pipe entering at the center. Rising air bubbles stir up the tank's contents and bring cooler oil to the burning surface. This cooling effect prevents the heat of the flames from generating the combustible oil vapor they feed on.

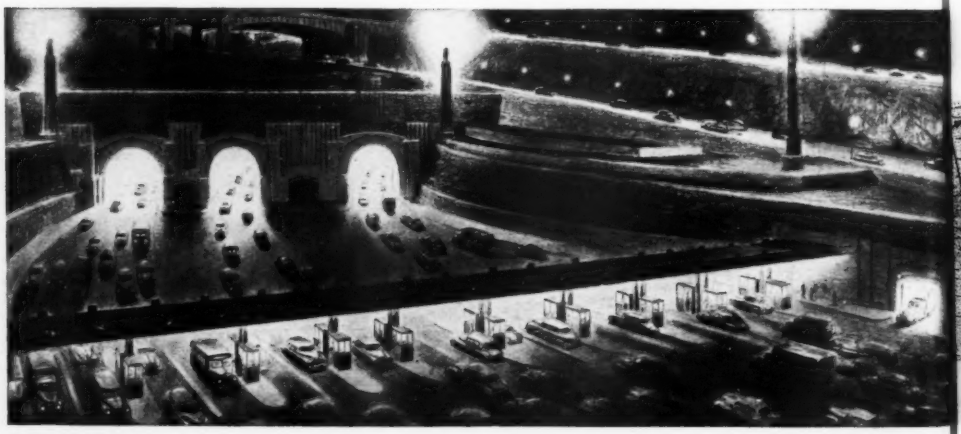
In five seconds, air injection put out a kerosene-tank fire in a test at the Olean, N. Y., refinery of Socony Vacuum Oil Co. Within 45 seconds it reduced the flames of a crude-oil fire to 12-inch height, killing their intense heat. Then the hot metal of the tank could be cooled with water, permitting firemen to climb to the tank's rim and finish the job in five seconds with fire-extinguishing foam.

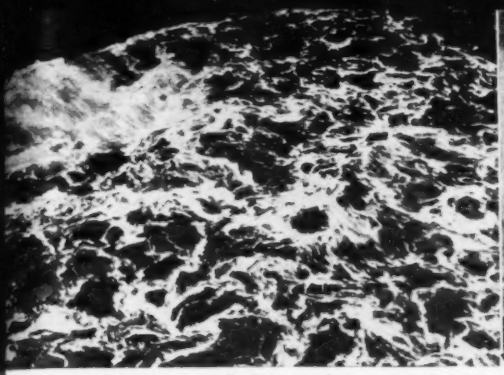
HUNDRED-THOUSAND-GALLON TANK of kerosene is set ablaze to test fire-fighting with air.

TANKFUL OF CRUDE OIL has been ignited for tryout of same fire-extinguishing method.

Tunnelers Plan Six-Lane Highway

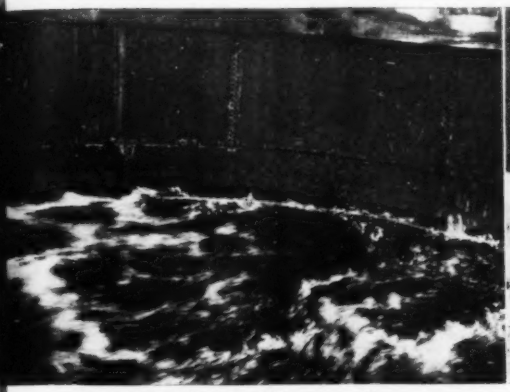
A NEW automobile tunnel beneath the Hudson River will add a third tube to the twin-tube Lincoln Tunnel to relieve congestion at one of New York City's busiest





FLAMES DIE on turbulent surface as air, injected from bottom, brings cooler liquid to top.

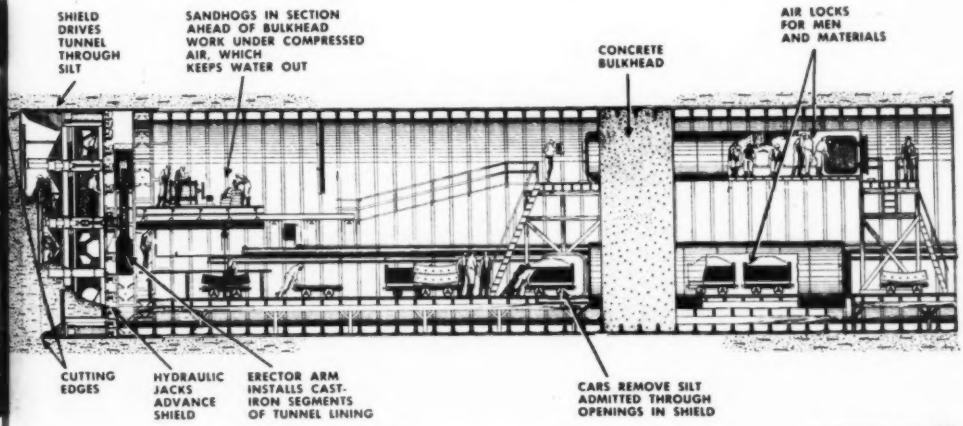
IN FIVE SECONDS, injection of air, through pipe entering bottom of tank, has put out fire.

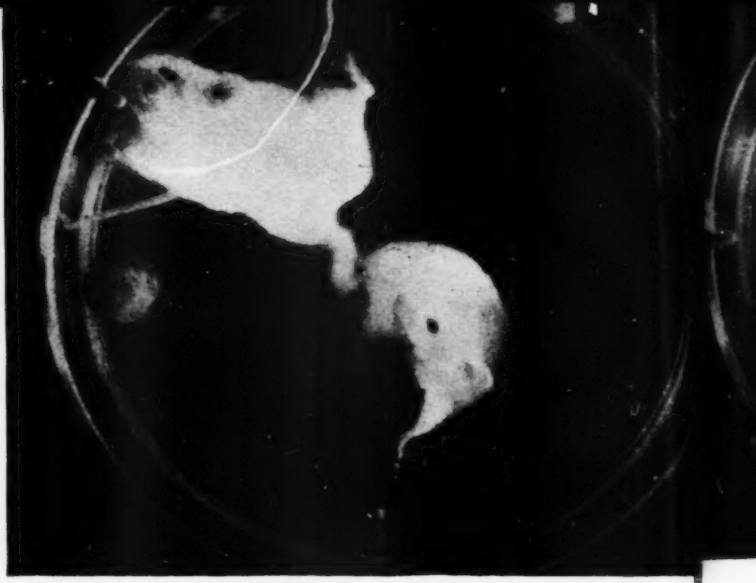


AIR INJECTION, in this case, does not put out flames but quells them to 12-inch height.

WITH FLAMES SUBDUED, firemen can reach rim of tank and use foam to finish putting out fire.

traffic links with New Jersey. It will share the same portal on the Jersey side (left below) and provide six lanes in all, with four carrying rush-hour traffic in one direction. Proceeding just as if the other tubes were not there, sandhogs will drive the new one by the standard shield-and-compressed-air tunneling method (right below).

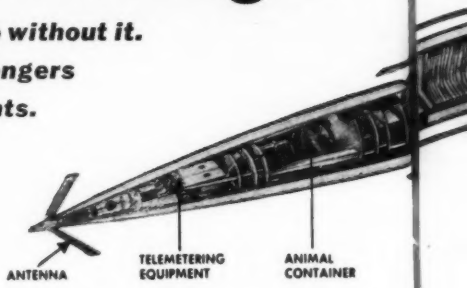




WEIGHTLESS MICE have tough time during 37-mile fall from Aerobee rocket, as shown in nearest movie frame at right. During zero-gravity period, mouse in a smooth drum is seen floating in air, while his companion in another drum is able to orientate himself by means of a small shelf to which he clings. Ball also is suspended in air. At far right, parachute drag has given mice back their weight. Both are behaving normally again, and ball is supported by drum wall.

Can We Live Without Weight?

Space travelers will have to learn to do without it. Mice are blazing the trail now as passengers in Air Force's high-altitude rocket flights.



TO TRAVEL and live far beyond the atmosphere that envelops our earth, men will not have to evolve into spindly legged, bubble-headed, antenna-eared monsters such as you have seen pictured in science fiction. Research now under way indicates that when men venture into space they will, in effect, take a friendly environment with them.

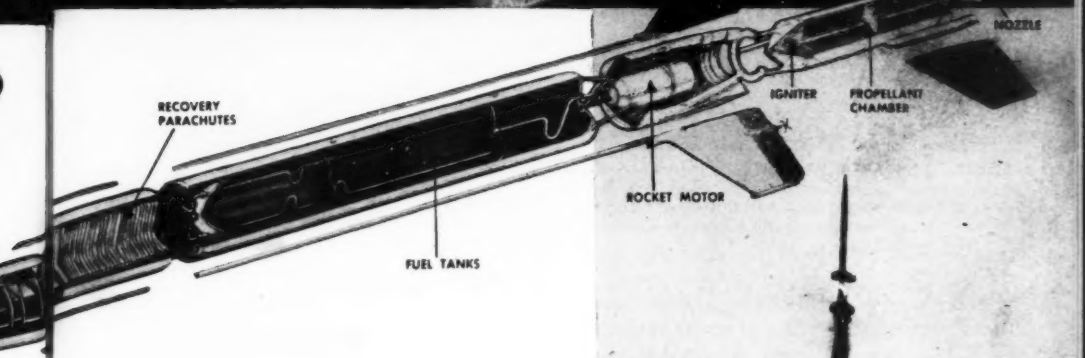
The first voyager to the moon, for example, will take along air to breathe, food to eat, water to drink, air conditioning to protect his body from extreme temperatures, and protection against cosmic, solar and meteoric bombardment. He will thus create around himself a little earth away from earth.

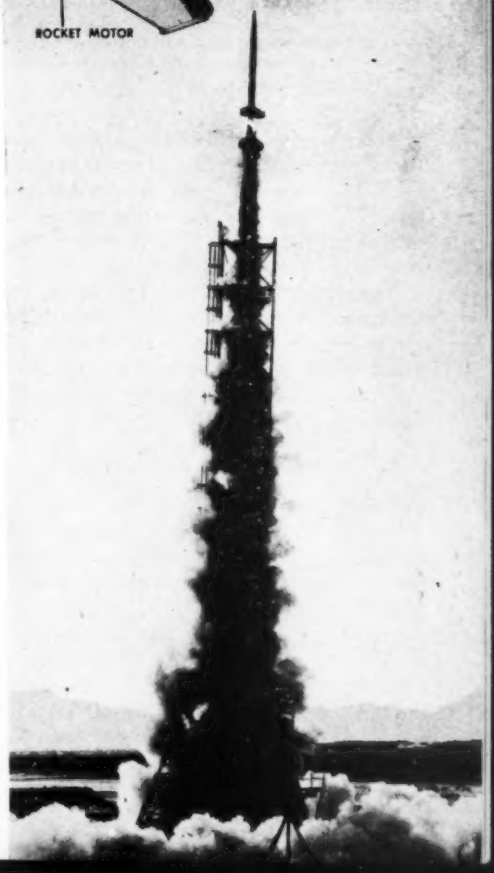
This will be necessary because a man is a very delicately adjusted mechanism.

But everyone who sets forth for another part of the universe will leave one thing behind—his weight. On the moon, the space traveler will regain one-sixth of it. On Jupiter, he will find that he weighs twice as much as he did on earth. But, while in space, the interplanetary tourist will be weightless, because he will be in what students of space medicine call "the state of zero gravity."

This eerie state is being studied now. Everyone, says Dr. James P. Henry of the Aero Medical Laboratory, Dayton, Ohio, has been in it briefly. When an elevator drops suddenly and you feel those stomach flutters for a few seconds, you are weightless. When a swing reaches the top of its ride and you no longer touch

INSIDE OF AEROBEE sounding rocket that carries mice and monkeys to high altitudes is shown in cutaway at left below. At bottom rocket is shown being launched at Holloman Air Force Base, Alamogordo, N. M. At height of about 37 miles, animal compartment is released. Slowed down by parachutes, it is recovered in the desert and effects of rocket flight on animals studied.



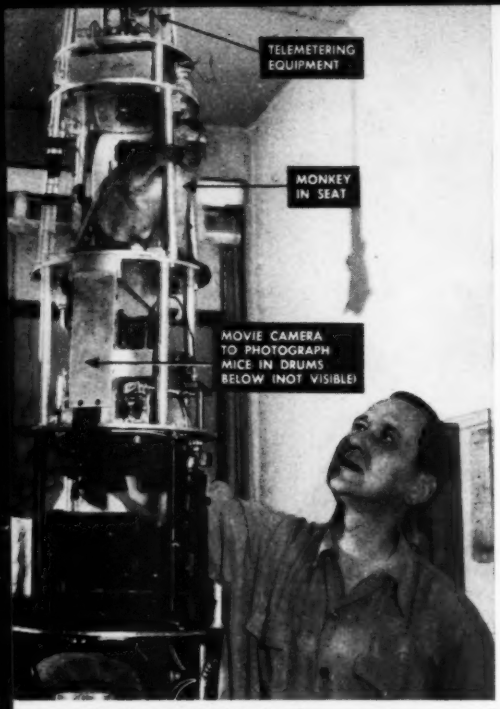


the seat, you are weightless. But what, the scientists ask, would longer periods of zero gravity do to a man?

Mice Fall from 37 Miles Up

They are using mice to find out. At Holloman Air Development Center, Alamogordo, N. M., mice recently were shot skyward in an Aerobee rocket. The mice were in rotating plastic drums in a nose compartment of the rocket. At an altitude of 37 miles, the compartment was released to plummet to earth.

While they fell, the mice were weightless—as anything that falls freely is weightless. Movies were made of their behavior during this period. The sides of one drum were smooth. In another, otherwise-identical drum there was a shelf to



ANIMAL COMPARTMENT that goes into nose of Aerobee rocket is compact. Monkey will be strapped into upper seat, will not show effects of weightlessness as will mice free in drums.

which a mouse could cling. And the pictures show that the mouse in the smooth drum became completely disoriented and floated in space, whereas the mouse in the other drum clung to the shelf and remained nonchalant.

Neither mouse showed any ill effects afterwards, either from acceleration forces which multiplied its weight 15 times when the rocket took off, or from the period of weightlessness during its descent.

If Mice Can Live, So Can Man

Hence, "it is possible," the Air Research and Development Command has concluded, "for a mammal to function within the range of normalcy during rocket flight."

The Air Force is conducting such experiments, not because it contemplates interplanetary flights soon, but because the new high-speed, high-altitude jet aircraft that are now being perfected will subject pilots to periods of weightlessness. These experiments, says Dr. Henry, the senior project officer, bear out the conclusions of interplanetary-flight dreamers that in space men will have to have some means of orienting themselves. They will have to be strapped while standing or seated, and have railings to help them walk about inside a rocket ship.

Man Must Take Environment with Him

Such experiments, however, have not cleaned up the problem completely. Dr. Henry and his colleagues do not yet know, for example, what hours or days of weightlessness would do to a man's mind. As Dr. Henry puts it, "these mice-missile experiments into weightlessness leave us about as far away from actual space travel as primitive man paddling on a log was from the superliner *United States.*"

Civilized man is not very tough. That, says Dr. Henry, is why man, when he reaches out into harsher frontiers, doesn't adapt himself so much as he relies on a protective environment. An example is the new Air Force base at Thule ("farthest land") in Greenland (PSM, Nov., '52, p. 161). Life is no bed of roses in Thule, but the Air Force and Army engineers have air-lifted and sea-transported and created an environment that brings living within comfortable limits of human endurance.

Air Force Previews Space Suit

In space flight the rocket itself will supply that environment. For emergencies, space suits might be carried. The Air Force's new T-1 emergency pressure suit, pictured on the opposite page, provides a preview of what such a space garment might be like. It supplies super-charged oxygen and body counterpressure to protect a pilot in case his cockpit pressurization should fail in the upper atmosphere. If this happened without protection above 63,000 feet, his blood would boil, bloating him with steam and causing death in a matter of seconds.

Man's mechanism operates to very

close tolerances, Dr. Henry points out. Internal temperatures, for instance, can vary by only about plus or minus one degree for comfort. *Primitive* man can endure a fairly wide range in his environment. He can function reasonably well with outside temperatures varying as much as 25 degrees either way; go without water for two to three days, without food for 10 to 20 days, without sleep for two to three days.

Moon Travel Still Far Off

Civilized man in society has created for himself a much milder environment. He still lives within a wide variation of natural temperatures, but he protects himself by light clothing in summer, heavy in winter, heated houses and air conditioning. Food and water he takes every four hours while awake; he gets eight hours of sleep a day. This environmental protection of clothing, vehicles and dwellings, Dr. Henry adds, has enabled civilization to spread out from warm, fertile river valleys and live in deserts, polar caps, on the sea and on high plateaus.

Because such a favorable environment must be provided in a vehicle that will travel to the moon, much research must be undertaken. Milton W. Rosen, the Navy's rocket expert, recently threw cold water on the enthusiasm of those who dream of interplanetary trips by declaring that "at present we cannot even estimate the feasibility of building a successful manned rocket."

The optimists, nevertheless, refuse to be daunted. Dr. Wernher von Braun, the German scientist who worked on the V-2s and is now serving as a rocket expert for the U. S. Army, declared on the same occasion that we would be traveling in space within the next 10 or 15 years.—*Herbert O. Johansen.*

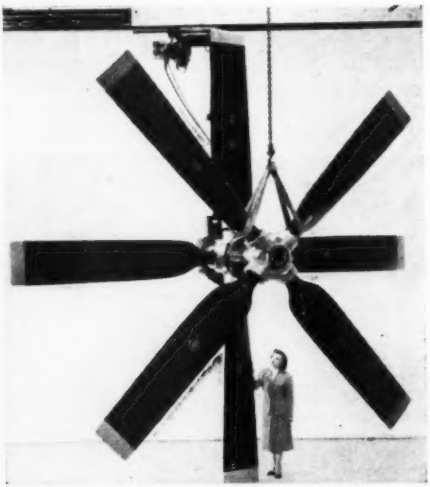
SPACE SUIT? Well, almost—it's the Air Force's new pressure suit that will enable pilots to live in case cockpit pressure should fail in near-vacuum of upper atmosphere. Altitude chamber at left enables test pilot to "ascend" to more than 50,000 feet while learning to use the suit. Actual space suit may be patterned after this model.

Office Merry-Go-Round Keeps Track of Airline Seat Reservations

EVER wonder how they keep plane reservations straight? Here's the way one airline does it. Trip charts, arranged in sequence by days, hang from electrically driven belts (**left**). When a reservation call comes in, the clerk pushes a toggle switch to run the belts right or left and bring the proper chart to hand. Space to check in reservations on 1,638 upcoming flights is provided. The Motorack is in use by United Air Lines at Denver.

One-Lunger Has Points Outside

ADJUSTING the ignition system of this new air-cooled engine is a cinch. Its breaker points and condenser are mounted outside the crankcase (below). Thus shroud and flywheel need not be removed to service points. The cam that actuates the breaker is driven off the camshaft, the points operating at one-half engine speed. Points last longer since every second spark is not wasted as in the usual four-cycle system, according to Continental Motors Corp.



Props Aim at Jet Speeds

PROPELLERS like the one above, driven by a new gas-turbine engine, are expected to fly long-range military aircraft at jet speeds—and may pave the way for propellered speeds up to 1,000 m.p.h. Although details are secret, it is known that propellers (whose tips spin at supersonic speeds) are available that can harness a power output of 20,000 horsepower. Advantages of turboprop over pure jet are greater fuel economy, greater take-off thrust and the braking effect of reverse propellers for short-run landings. The new turboprop engine is being developed by Curtiss-Wright.

DASHBOARD HAS CLOCK (left), speedometer (right), and a glove compartment below handbag hook. Left-hand controls are clutch and gearshift; right-hand, throttle and brake.

Dressed-Up Scooter Goes Places in Style

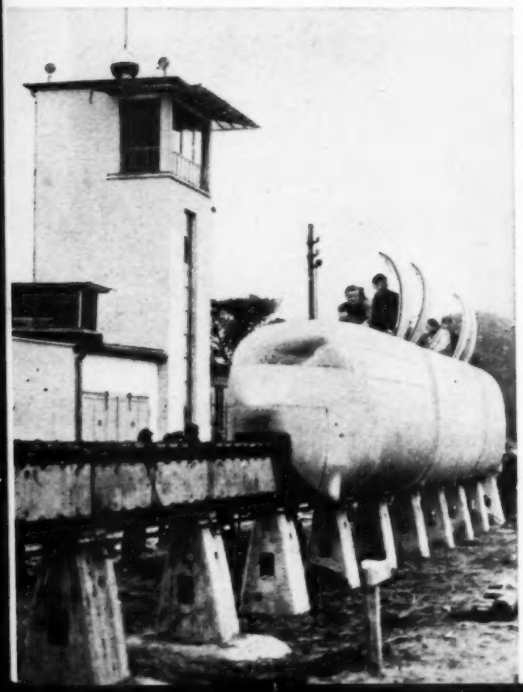
THE world's first motor scooter with a car-type dashboard—housing a speedometer, clock and glove compartment—has made its appearance in this country. The NSU-Lambretta isn't the fastest scooter (PSM, Dec. '51, p. 164), but it may be the most luxurious. It has such features as a dimmer switch on the headlight, an illuminated panel, a steering-column lock and a hook for handbags. The one-cylinder, 4½-hp., two-cycle engine can do 50 m.p.h. The importer is Butler & Smith, NYC.

LATEST LAMBRETTA SCOOTER is fancied-up with automobile accessories. Good for 100 miles per gallon, it has wide footboard, high leg shield, tubular frame.

French Test Gas Turbine on Car, Plan to Use It in Trucks

GAS-TURBINE cars, of which Britain's Rover was the pioneer example, are now being developed in France as well. With a 100-horsepower gas turbine installed, the test car above is said to have reached 120 miles an hour. The Socema Research Co., which developed the engine, plans to use it in trucks and other heavy vehicles.

AT 60 M.P.H., passenger-carrying model of streamline monorail train hits a steeply banked curve. Turns of same radius would limit a conventional train to about 18 m.p.h. Performance of high-speed "train of future" was demonstrated recently at Cologne, Germany.

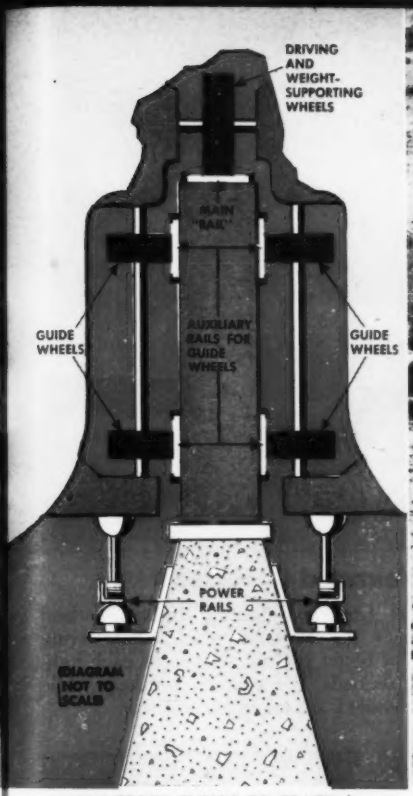


Will This

TO MAKE travel on land as fast as by air, a monorail train invented in Germany is designed to race at more than 200 m.p.h. along a track of radical new design. At a preview, spectators recently watched trials of a passenger-carrying scale model on a mile-long "monorailway" constructed at Cologne, Germany, with the backing of Axel Wenner-Gren, Swedish multimillionaire.

Two-fifths of the projected size, the model train is a three-section streamliner, with a

PASSENGERS BOARD COACH, whose top-hinged panels are raised to admit them, for trial high-speed run of the monorail streamliner. Control tower of system is just left of train.



HOW TRAIN CLINGS TO TRACK is seen in diagram above. Guide wheels keep main wheels centered on top "rail" and give lateral support against toppling. Driving motors draw current from twin power rails. Switch, in photo at right, is simpler than two-rail type.

Train Top 200 M.P.H.?

coach between power cars. Passengers get on and off through openings provided by lifting panels of the coach's body.

The train's lower half, containing its running gear, literally wraps itself around the special track. Flangeless wheels along the cars' center ride a main "rail," a flat metal ribbon atop a continuous block of reinforced concrete. Guide wheels on vertical axles of the running gear engage similar metal ribbons, extending in pairs along the sides of the concrete block.

Turned by electric motors, the driving wheels of the train exert tractive force upon the top rail, which also supports the train's weight. The guide wheels and auxiliary rails hold it centered on the top rail.

Because of the lateral support given by the guide wheels, the train cannot tip over, even if it should be stopped upon a curve banked at an extreme angle for high speed. This key feature eliminates the complication of using a gyroscope, as earlier monorail-train designers attempted to do, to balance a car upon a single rail.

In its trials, the model train has attained 95 m.p.h.—a "scale speed" said to demonstrate the feasibility of the full-size train's predicted speed of 200 m.p.h. And as for switching trains from one track to another, a switch built into the test layout actually proves to be simpler, mechanically, than the type used with conventional two-rail track. END

Floating "Arms" Receive Airborne Wounded in Korea

STRETCHED out on each side of the hospital ship USS *Haven,* seen above anchored off the Korean coast, are large pontoon floats which serve as landing strips for Marine helicopters bringing in wounded men straight from the fighting front. Medical corpsmen on the floats start administering the vital blood plasma as soon as each helicopter unloads. The process continues while the wounded are taken aboard ship.

75 years ago this month

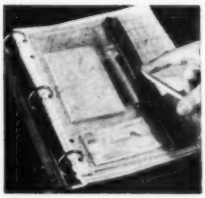
Popular Science Monthly reported:

"THERE was exported from China to Europe, in the year 1875, the enormous amount of sixty tons of human hair. This hair is ostensibly the product of the sweeping of barber shops, but there is little doubt that much of it represents 'pigtails' feloniously snipped from their wearers' heads."

Pocket Magnifier Lights Up

THE 10-power magnifier this girl is using weighs only 2½ ounces, clips to a pocket like a fountain pen and has a built-in lamp powered by two penlight batteries. The light shines through the lens onto the object without obstructing the user's vision. Bausch & Lomb make the magnifier.

Plastic Pocket Fits Notebook



THIS plastic pocket snaps into a loose-leaf notebook to keep writing tools handy. Made by Renick Boggs & Co., 412 N. Orleans St., Chicago, it has a zipper opening.

Pinwheel Motor Keeps Guided Missiles Steady

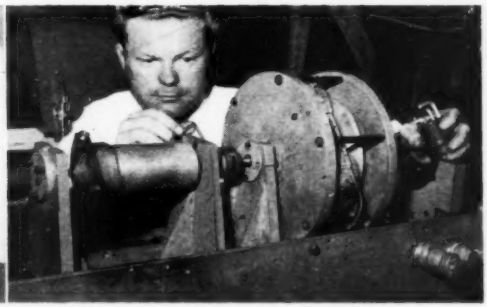
A ROCKET motor only 5½ inches long and weighing 3½ pounds may soon be making sure that air-to-air guided missiles land smack on their targets. It is designed to do two important jobs: supply power for the missile's "brain"—the radar or TV set in its nose—and maintain pressure in the hydraulic system that controls the missile's tail surfaces.

An invention of Jack Zillman, a California research engineer, the Whirlajet is a tiny gas-driven turbine spun by the thrust of exhaust from a burning stick of propellant. It would be built into a section of the missile case.

The little rocket motor, not yet in production, has only four parts: barrel, into which a cartridge of plastic or rubber is fitted; cap; and two tiny nozzles. To start the motor, which can provide 20 horsepower, an operator switches on a heater wire in the motor by remote control, thus igniting the rocket's solid fuel.

1 A POUND OF FUEL, in the form of a cartridge, is about to be fitted into a Whirlajet barrel by Jack Zillman, who invented the motor.

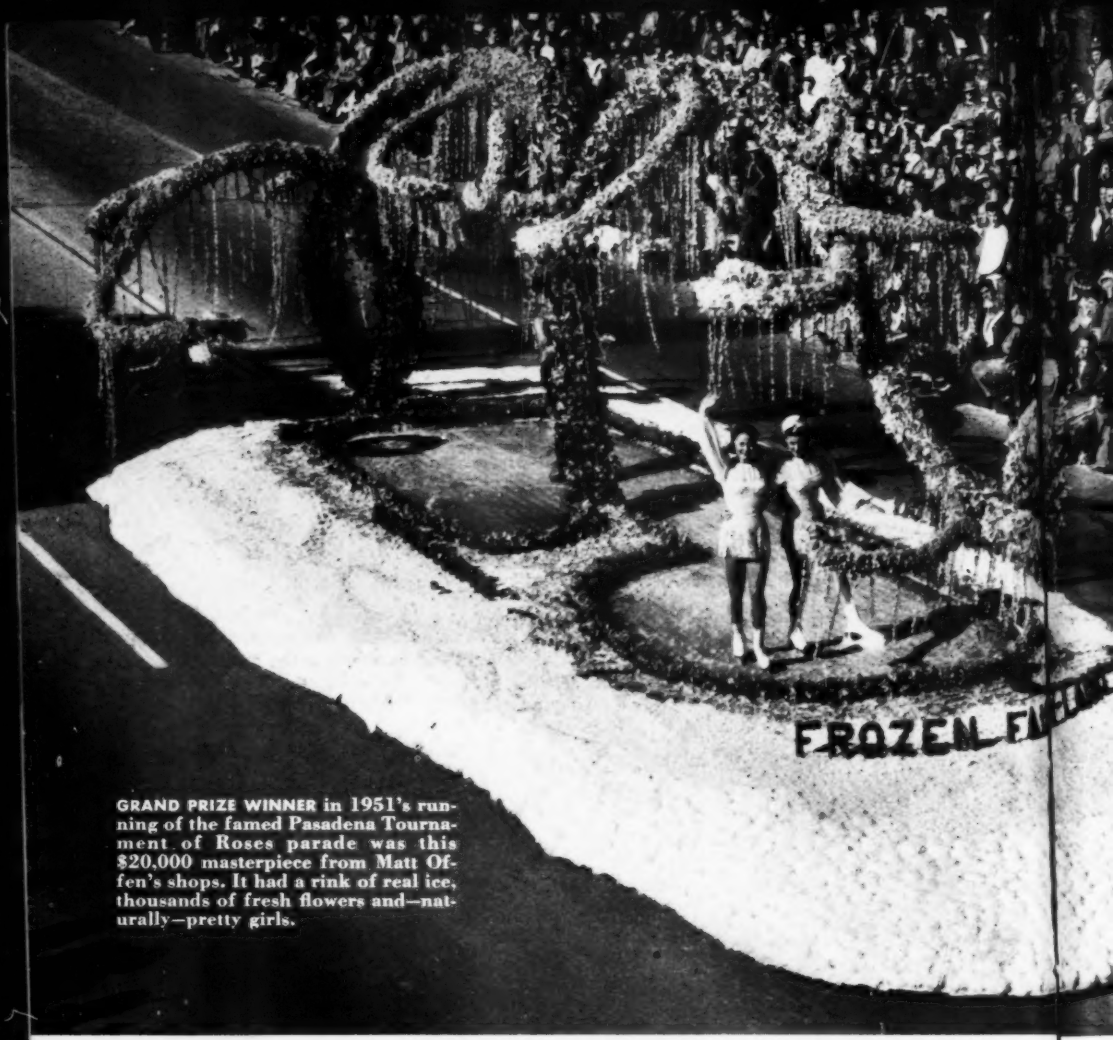
2 EXHAUST NOZZLES are in the side of this cap, ready to be screwed on. Thrust of exhaust gases spins the entire motor on its end shafts.



3 TORQUE AND SPEED of a Whirlajet are measured by letting it blast against a dynamometer. Motor runs four minutes.

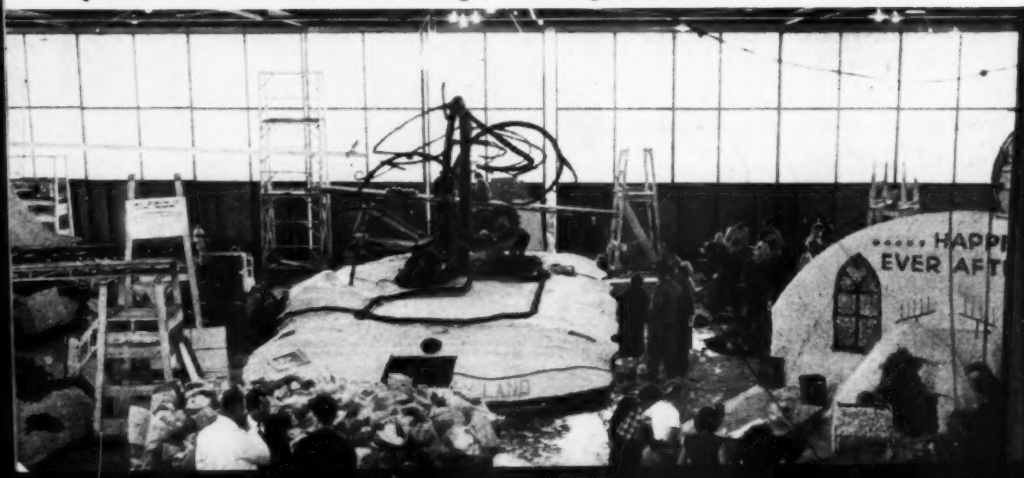
Cold-Water "Steamer" Removes Stamps

PLACE canceled stamps cut from envelopes on the perforated plastic tray at right, put the cover on and in 25 minutes you will be able to peel the stamps off easily. Moisture from water-soaked felt pads under the plastic does the trick. General Designing Service, Box 167, San Francisco, makes this aid to stamp collectors.



GRAND PRIZE WINNER in 1951's running of the famed Pasadena Tournament of Roses parade was this $20,000 masterpiece from Matt Offen's shops. It had a rink of real ice, thousands of fresh flowers and—naturally—pretty girls.

THAT DUBIOUS-LOOKING HEAP of materials in the center of the photo below grew into the spectacular creation above in Offen's hangar-like plant. Here it is actually half done, with drive motor and refrigerating unit installed. Rectangular hole in front was cut for driver.



THE DRIVER IS NEVER HAPPY buried, as he usually is, in a cramped nest of wire and blooms. To pilot the craft above, one had to lie flat.

His Floats Lead the Parades

Matt Offen, top man at building these flower-decked behemoths, has 400 workers turning out 60 a month at prices up to $20,000.

By Darrell Huff

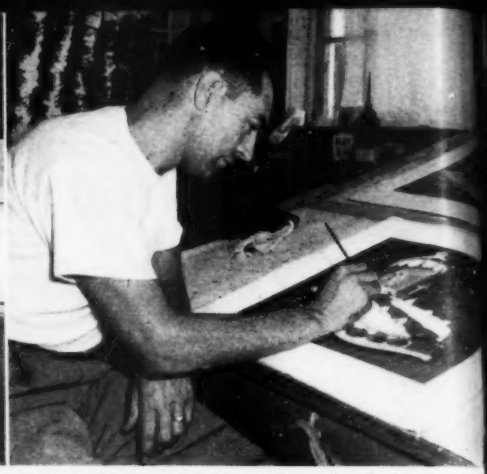
BANDS boom, troupes of trained horses prance by and 60 motorized flower shows, gracefully animated with pretty girls, glide down the palm-lined avenue. It is New Year's Day morning in Pasadena, Calif., and 2,000,000 pairs of eyes—not counting TV and newsreel cameras—are watching the fabulous Tournament of Roses parade that precedes the Rose Bowl football game.

This being the day after New Year's Eve, many of those eyes will have a bleary look. But just about the reddest-rimmed will be the blue eyes of burly, blond Matt Offen.

Matt will not have been to bed for two days and nights.

It's that way every year for the ex-athlete and Navy PBY pilot who now, at 31, is the world's biggest builder of parade floats. These luxuriant, self-propelled behemoths make Pasadena momentarily the glamour center of the world. Some

THE BOSS AT WORK (left) with his happy sales manager at hand. The firm invites orders by long-distance calls, for which it pays, and guarantees its floats against all damage.



FLOATS START HERE, on superintendent's drawing board. No formal production line is needed to build them, for they are simply hauled from station to station in two-building plant.

of the best and costliest of them are Matt's work.

Every inch of a Tournament of Roses float must be covered with flowers. Fresh blooms don't keep long. So millions of roses and camellias and orchids must be individually glued into place in the final two or three days and nights.

Of last year's 60 floats, 18 were Matt Offen's work. This year again his Valley Decorating Co. is building more than any other outfit.

Poker Helped

Out of service and back home in Fresno in February 1946, Matt found he had saved, or won at wartime poker, about $10,000. Casting about for a business to go into, he came upon a merchant who was eager to dispose of 15,000 flags and a stock of bunting that had been gathering dust. Matt bought them and rented a 15- by 40-foot basement. Rodeos, homecomings and festivals revived so fast that he did $13,000 worth of street-decorating business that year and $60,000 the next.

One day a committeeman from Fresno's annual Mexican celebration dropped in and asked Matt if he made floats.

"Why sure we do," he said, and set about learning how. Matt and his wife and his father built that first float in Matt's back yard. When their $150 experiment copped first prize, Matt knew he had something big.

It was clearly too big a business for a basement and a back yard. Matt leased a pair of one-time Air Force motor-maintenance buildings six miles from Fresno. These, along with the branch quarters at Alhambra, now house his space-eating enterprises, which employ more than 400 people at the peak season.

In these tall, big-doored buildings, floats are turned out at the imposing rate of 60-odd a month. These mass-produced floats are quite different from the self-propelled monsters of the Pasadena parade. Basically they are trailers, often with small aircraft wheels. They are pulled by trucks. You see them at local celebrations all over the West. They are the bread-and-butter of the float business. For about $500, for example, Matt will design a float to suit a client town or company, build it, and generally take care of it all summer. If the client wishes, he will provide a truck and driver to haul it. He'll store and refurbish it between parades.

All this is economically feasible because the float remains Matt's property. After it has served for a season he can tear it down and use the chassis again. And although each superstructure is a

LETTERS ARE CUT OUT, and small decorations, too, with portable electric saws. Power tools, paint sprayers and welding equipment are the principal "machinery" used to build floats.

SPRAYERS ARE BUSY practically all the time, for many floats are either plastered or cocooned, and colors usually have to be touched up on each stored float as a new season opens.

custom job, he may salvage that, too.

The ordinary trailer float is not much of a construction job really, as Matt sees it. Just chassis and superstructure, mostly of welded steel rods, and then paper and colored metal foil.

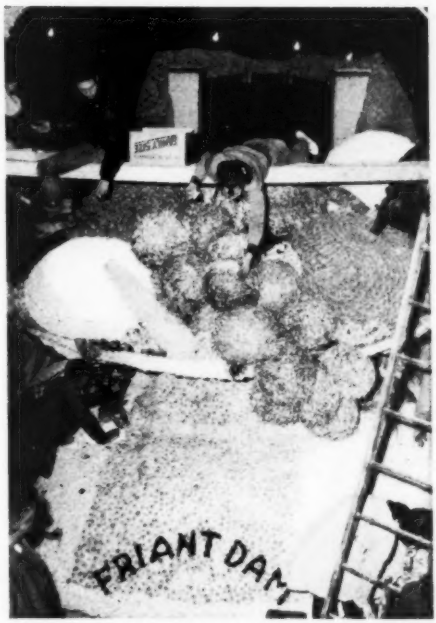
Frozen Fairyland the Costliest Ever

Matt's Frozen Fairyland, however, grand prize winner at the 1951 Tournament of Roses, was undoubtedly the most costly float ever built.

It began as an idea: "Let's build a float that has girls skating on a miniature frozen lake." The first trick after that was to find a sponsor interested in putting up $20,000 to build something that most people in the business were already saying wouldn't work.

After seeing sketches and a tiny model, officials of the Union Oil Co. of California agreed that this was what they wanted: a floating ice rink 20 by 48 feet with the highest point of its bed a bare 21 inches from the ground—down where everybody could see everything as it went by. Over this should tower a great snaky tree, a sort of wide-spreading jungle plant of steel covered to the smallest branch with fresh flowers.

Here were mechanical problems that couldn't be solved by cutting up a truck and stretching it out. This one would



GLUING ON THE FLOWERS, the final operation on a Tournament of Roses float, is such a delicate job that much of it has to be done by workers stretched out on scaffolding overhead.

have to be built from the ground up, and it was: a chassis welded from structural steel, dual tires, axles of 2½-inch steel to hold the 14 tons.

"People said we couldn't find an engine powerful enough to pull 14 tons

and still fit within what we could use of the 21 inches of height," Matt recalls. "Well, we solved that one with a 15-hp. engine geared down 64 times.

"They were sure we couldn't freeze—and keep frozen—300 square feet of ice in the California sun. And if we did, they said it would break at the first bump."

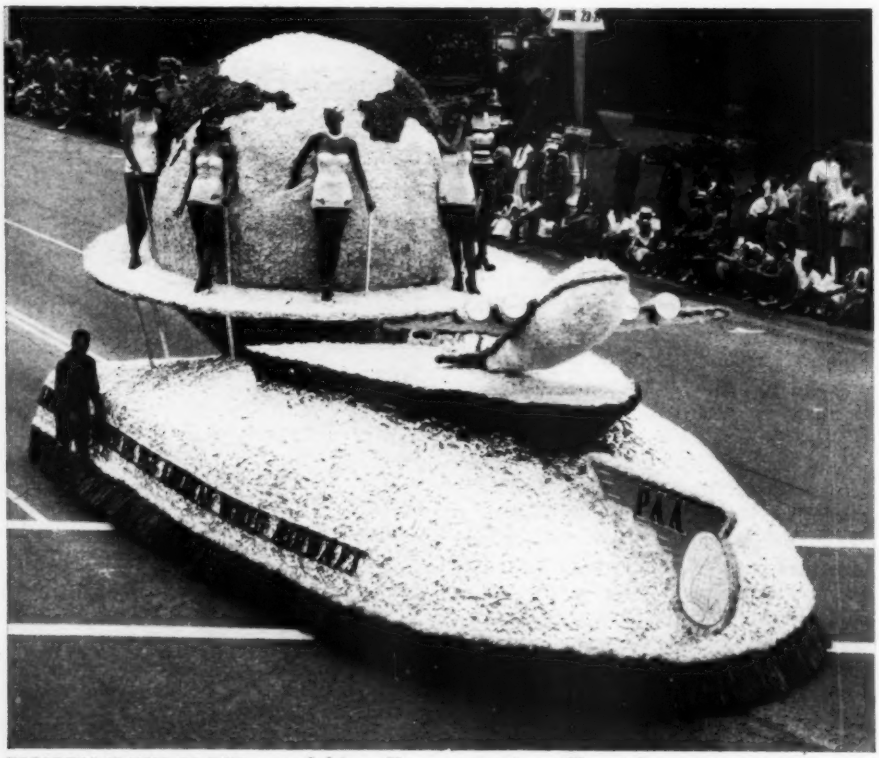
With help from refrigeration experts, Matt finally got a unit built inside the float frame. A gasoline generator powered an electric motor to blow the freezing vapors of 600 pounds of dry ice over a heat-exchanger coil. Another motor kept brine pumping through pipes only 1½ inches apart all through the pond. The ice was suspended independently so it wouldn't crack on the bumps.

But few of the 2,000,000 spectators who saw this float knew, or cared, anything about the steel and mechanical contrivances that made it possible. What they saw was a great pond of clear ice surrounded by a bed of some of the prettiest and most expensive snow you could ask for: specially grown white chrysanthemums. Trimming it were hundreds of delphiniums, cornflowers, camellias, roses, lilies of the valley.

The wide, graceful tree above all this had its welded steel trunk hidden beneath 6,000 orchids and half that many red and yellow roses with maidenhair fern among them. Its branches bore 75,000 sweet peas.

Under the blooms of Frozen Fairyland danced and twirled three skaters, glistening in mirror-studded costumes.

All this went down the avenue of palms without a hitch. Matt Offen stopped sweating and went off to get some sleep. END

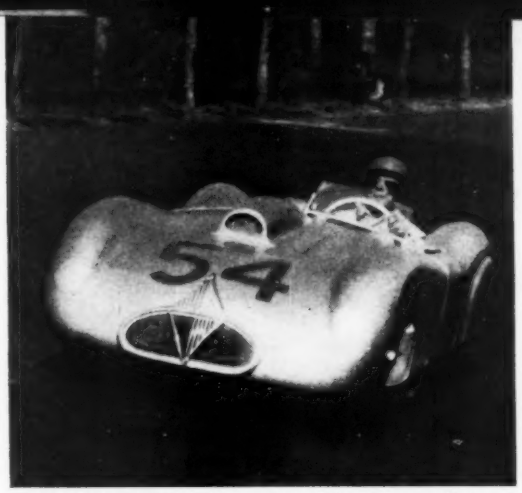


PASADENA IS USED TO THIS sort of thing. Nevertheless the Offen creation above won lots of attention. The girls, as is customary, were local college beauties and student actresses.

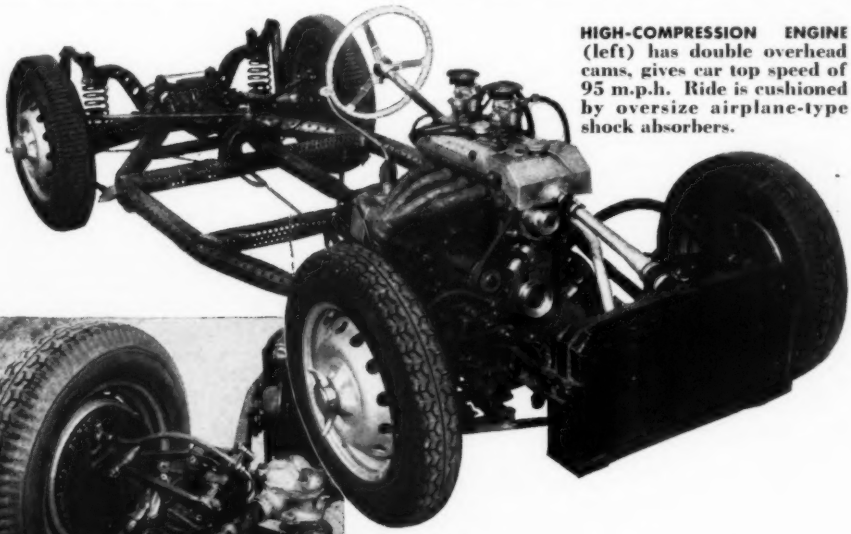
German Racer Is Testing Laboratory for Stock Cars

THE snout-nose racing car at right is the new German-made Borgward, which won a name for itself in the latest running of the German Grand Prix. But it was designed for a humbler role in life. A four-cylinder car, the Borgward is being used by its builder to try out equipment intended for future sports models in the company's passenger-car line.

The Borgward is currently testing a tubular frame punctured liberally with holes to save weight (below). It also is using aluminum wheels and brake drums.



CARBURETOR HUMP in the center of the Borgward's hood is screened, but there are no air filters on top of the two downdraft carburetors. At first there were skirts covering the front wheel housings, but brakes overheated.



HIGH-COMPRESSION ENGINE (left) has double overhead cams, gives car top speed of 95 m.p.h. Ride is cushioned by oversize airplane-type shock absorbers.

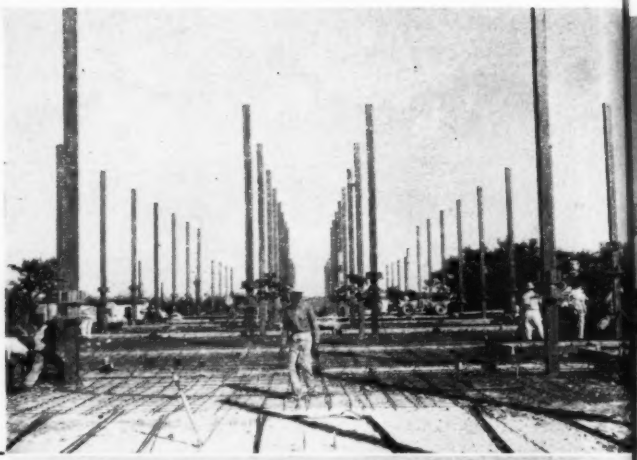
COOLER BRAKES are assured by holes drilled in the braking plates, as seen at left, and by a special air duct in the front of each.

Heart Valve Replaced by Plastic

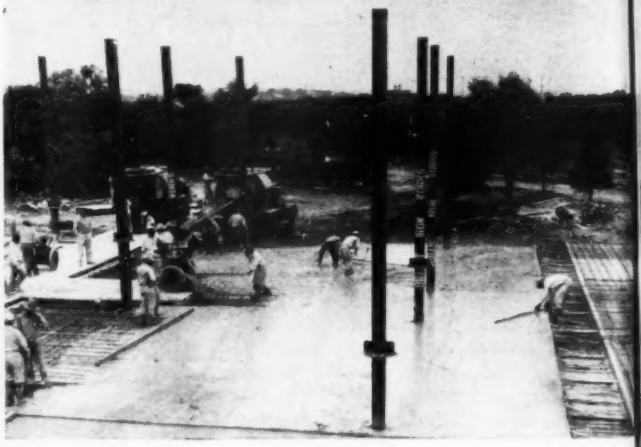
IT LOOKS like a toy lantern, but the object the nurse at right is holding is a plastic heart valve, used successfully in a delicate surgical operation at Georgetown University. The valve was inserted in the main artery of a woman's ailing heart, replacing her own valve, damaged by illness.

Three concrete slabs are poured on the ground,

1 CLASSROOM building for Trinity University, San Antonio, started out this way. Four dozen steel columns were positioned, and reinforcing steel grids laid to receive concrete. Method was conceived simultaneously and independently by Philip Youtz, New York architect, and Tom Slick, Texas oilman. It was perfected in laboratories of Institute of Inventive Research and Southwest Research Institute.



2 CONCRETE is poured for the second floor. Collars on steel columns will support roof. Introduced only in 1950, (PSM, Mar. '50, p. 111), Youtz-Slick method already has been used in constructing 100 buildings from Texas to Canada. It saves time, is less costly than conventional methods. One building now contemplated will rise six stories. That, inventors say, is limit to which slabs can be pumped into the air.

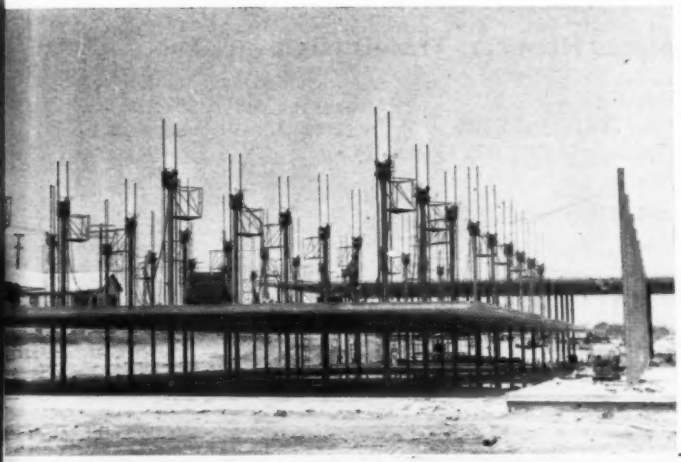


This Building Is Just a Stack of Flapjacks

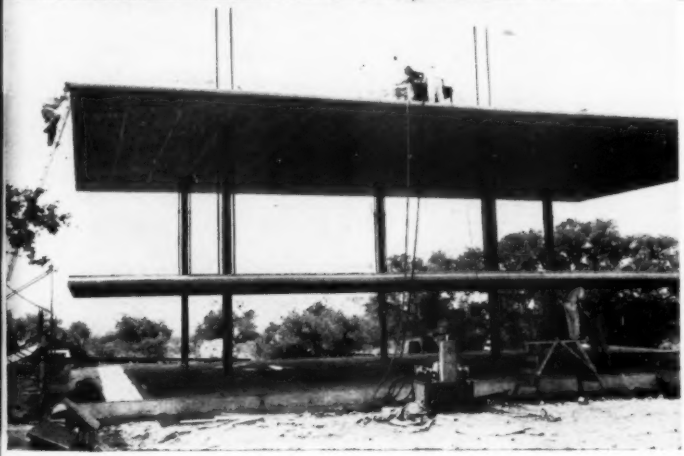
THE big concrete-and-glass building at left is a stack of flapjacks—made of concrete. The way it was constructed may revolutionize building methods for structures as high as six stories.

Big "pancakes" of concrete were poured at ground level and inched up into position by hydraulic jacks to form the roof and second floor. This is known as the Youtz-Slick lift-slab method.

then two are jacked up as roof and second floor.



3 ROOF IS POURED now and the jacks are mounted on columns to hoist it into place. Slabs are raised two inches at a time. Each jack can lift 100,000 pounds and is accurate to 1/16 inch. Yet jack needs only a 10-horsepower electric motor to maintain pressure in hydraulic lines. Rate of lift is about four feet an hour. Collars are welded into place when slab reaches proper height.



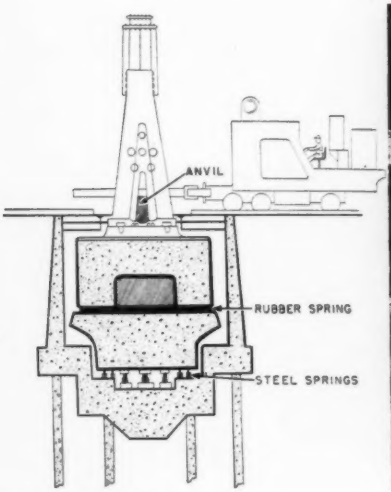
4 SECOND FLOOR is going up. Tiny figure on roof is jack operator, who raises slab and himself by "playing" control console. Once roof and intermediate floors are in position, workmen complete building by adding non-weight-carrying walls and partitions. At Trinity University, engineers poured 14 separate slabs in forming second floor and roof of building 384 feet long, 61 feet wide.

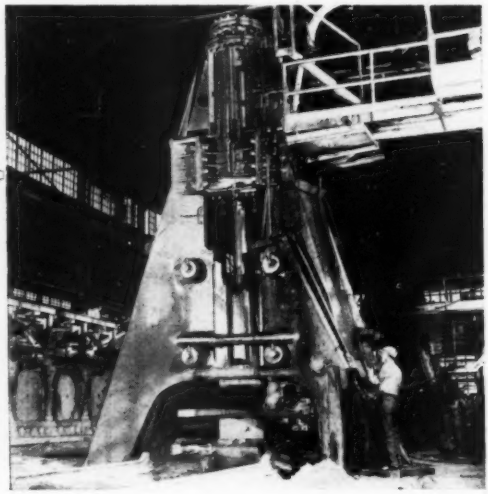
Rail-Riding Jeep Replaces Handcar, Travels Highway, Too

A SOFTER life for railroad section gangs and inspection men is assured by the new kind of jeep pictured above. The men ride in a snug caboose. Flanged guide wheels front and rear, which are raised and lowered hydraulically, keep the rubber tires on the track until the driver finds it convenient to take to a nearby highway.

Three-Story Mechanical Blacksmith Rests on Spring Bed

THE hefty steam-operated hammer shown below used to send damaging quivers through a 90-acre factory in Huntington, W. Va., with mighty poundings backed by 5,000 pounds' pressure. Now it forges huge nickel-alloy ingots without disturbing a single nearby windowpane. That's because it literally floats on a pair of concrete rafts supported, as the drawing at left shows, by both rubber and steel springs. The latter, 432 of them, are coil springs somewhat like those in a railroad car.





Banshee Chases Demon in Test of New Navy Jet

LIKE a fledgling followed by mama, the XF3H-1 Demon (left)—newest Navy jet fighter—tries its wings escorted by an old hand. A Banshee chases after the single-jet, swept-wing experimental fighter, sticking close to make flight observations. The two pilots keep radio contact, a camera in the chase plane films maneuvers. Both planes are made by McDonnell. Banshee tops 600 m.p.h., Demon's speed is still secret.

Classroom TV Shows Science Experiments

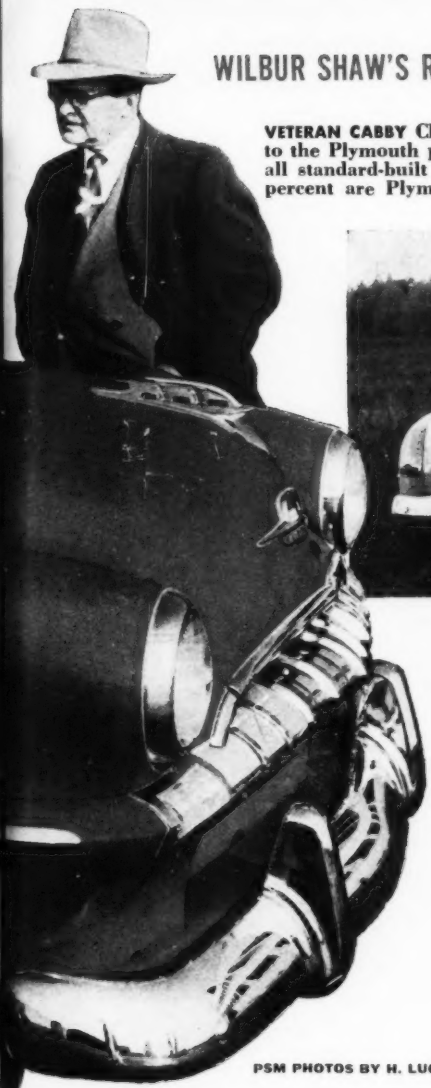
TV is working its way through college. At Cornell, a midget camera is helping students get a good view of what's going on in physics classes. Phenomena invisible to the naked eye are photographed through a microscope and flashed on two RCA screens that can be seen anywhere in the room. The setup is also used (left) to let the whole class see small objects like meters.

Tiny Wire Recorder Fits in Your Hand

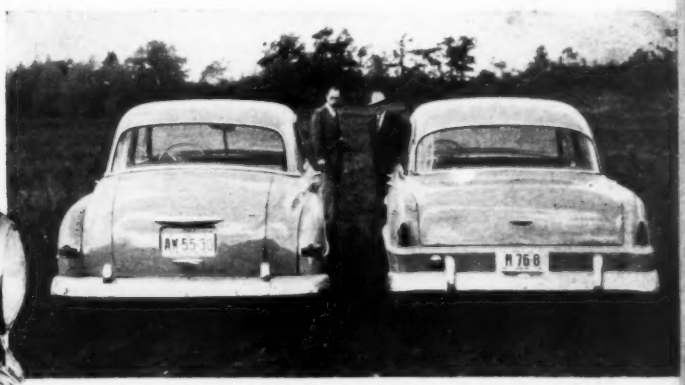
SMALL enough to be spanned by a woman's hand, this German wire recorder weighs only two pounds. It runs on four batteries (two in parallel power a nine-volt motor) and holds enough wire to record for 2½ hours. One of its two microphones is shown worn on the wrist. There is also a headset for playing back and a spare reel of wire. The Minifon is made by Monske and Co. of Hanover, and sells for 680 marks, about $156.

1953 Plymouth Smooths Rough Roads

WILBUR SHAW'S REPORT FROM THE DRIVER'S SEAT



VETERAN CABBY Charles Truesdale, who drove me out to the Plymouth plant, looks over the '53 model. Of all standard-built cars registered as taxis in U.S., 57 percent are Plymouths. Charlie drives one himself.



REAR-VIEW COMPARISON of '52 and '53 models shows how new car (right) has been given lower, wider look by restyling window, deck lid and fenders. That's Bob Steere, Plymouth's young assistant chief engineer, with me in background.

There's a new front suspension, axles are moved in closer together and weight farther out—all adding up to a remarkable ride.

PSM PHOTOS BY H. LUCKETT

ON THE way out to the Plymouth plant I leaned forward and asked the Checker cabby how he liked the car he was driving. It was a '52 Plymouth.

"Mister," he said over his shoulder, "we put 100,000 miles on these babies in one year. I push this hack daytimes and another guy takes it nights. She runs good and there's not always some little thing breaking down . . ."

Would he care to take a gander at the '53? He would. And when we got to the plant he did. He liked that one, too. In fact, I could see he was itching to get his hands on a '53 Plymouth cab.

To tell you the truth I was a little surprised when I got my first look at the new Plymouth. I've always liked this sturdy, conservative car. But here was something I hadn't expected—brand-new body lines that caught the eye like a dollar steak on a restaurant menu.

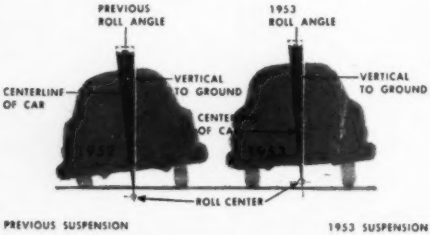
Beside me, Newt Hadley, Plymouth's chief engineer, waited for my reaction.

"Mighty smart looking car," I said.

"*We're* kind of pleased with it," Hadley grinned. "But that's only half the story . . . I want you to pick the roughest road you find and give it a workout."

I did just that. I know a stretch of

blacktop outside Detroit that I wouldn't wish on my worst enemy in a Rolls. I took that shiny sedan out there and poured it on. When I looked at the speedometer and read close to 65 on a surface where some cars would be hard to control at 40, I was convinced there was news at Plymouth for '53.



Comparative effect of roll on car.

When I got back I had a session with Hadley and assistant chief engineer Bob Steere. Here's the meat of the story:

In addition to the desired forward movement of an automobile, there are three kinds of motion you *don't* want—pitch, roll and bounce. That is—rocking from front to rear, sidesway in taking a turn, and motion up and down. This year Plymouth has tackled all three at once.

To reduce pitch the rear axle has been moved forward. That's right—the wheelbase is shorter. We've always been led to believe that a long wheelbase is essential to a good ride. That's one way to do it. But Hadley and Steere say that it's not the only way. The sketches on this page show how they explained it to me.

The point where the top suspension arms are attached to the frame has been lowered one-half inch, to give a non-parallel front-suspension linkage. This has raised the roll center—lessened the car's *tendency* to roll on turns. *Resistance* to roll has been increased by splaying the rear springs and using wider leaves.

Oriflow shock absorbers take care of the bouncing. I was enthusiastic about these shocks when I first told you about them (PSM, Feb. '51, p. 98). Plymouth claims they're even better now.

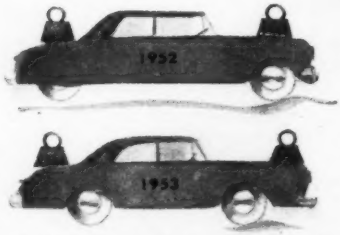
The car's speed and pickup are not exceptional, though there is no cause for complaint on that score. Only a few minor changes have been made this year in the power plant, but it does seem a bit livelier. Bob Steere has an answer to that: "By cutting an ounce here and an ounce there we've reduced car weight between 50 and 60 pounds. That improves performance as effectively as if we increased the piston displacement."

The zero-to-60 reading I got on the car I tested was 15.7 seconds. This car won't win any drag races, but that's respectable acceleration in any man's league.

Most of the new features are brought out in the photographs but there are a couple I want to mention here.

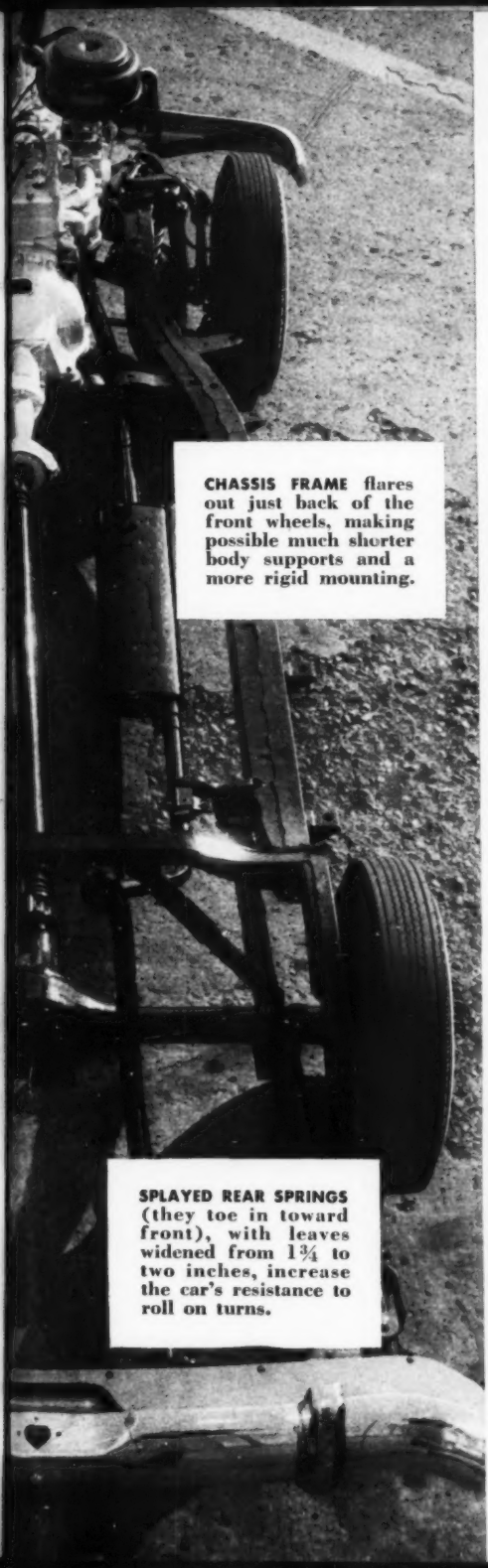
The car looks a lot lower. That's mainly an optical illusion (it's less than an inch, actually). The eye is fooled by a lower belt line combined with higher fenders and rear deck, and a roof that

EVENLY DIVIDED WEIGHT resting far out from a single load-bearing point would result in minimum "seesawing," or pitch.



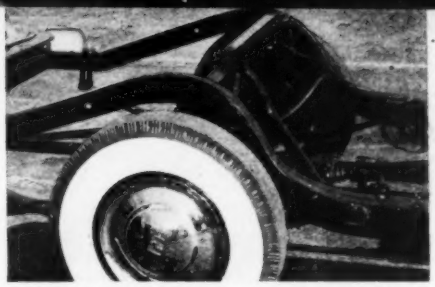
IN '53 MODEL, Plymouth has more nearly approached this imaginary ideal by moving the axles closer together and weight farther out.

slopes down at the front with a sort of visored effect. This last point I didn't care too much for—it might reduce visibility for a tall driver. But the long-legged motorist gets a break in another way—the shift lever has been moved from the side to the top of the steering column, which means more knee room for a big guy. Hubert Luckett, PSM's six-foot three-inch staff photographer, was along to shoot the pix—and it was Lucky who spotted that one.



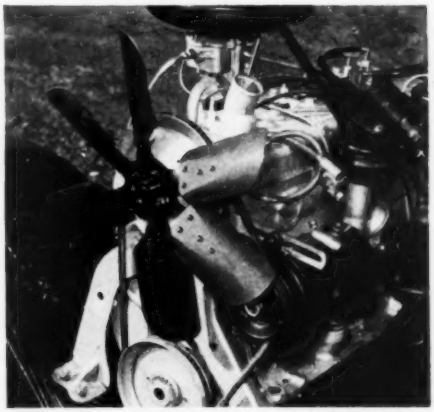
CHASSIS FRAME flares out just back of the front wheels, making possible much shorter body supports and a more rigid mounting.

SPLAYED REAR SPRINGS (they toe in toward front), with leaves widened from 1¾ to two inches, increase the car's resistance to roll on turns.



ABRUPT KICKUP of frame lets rear seat back up closer to wheel housing. This, plus fact engine is 2½ inches farther forward, makes car roomier even with rear axle moved up.

I WAS PARTICULARLY PLEASED by elimination of useless air space in front of engine. With today's compact power plants it's time we got rid of those long, view-obstructing hoods.



HERE'S A CLOSE-UP of the new six-bladed fan. A bigger fan pulley slows it to less than engine speed, cuts noise. Blades are spaced unevenly to avoid setting up resonant vibration.

Please turn the page for more Plymouth photos.

REDESIGNED INSTRUMENT PANEL has the glove compartment in the center for the convenience of the driver—as well as his wife. Ash tray is now just to right of steering column. I liked the absence of sharp projections on the dash—they can be dangerous in case of a crash or sudden stop.

TRUNK SPACE is 30 percent bigger. Hinges are at sides, out of the way. I don't know about you but I'm tired of having my bags mashed by trunk hinges. Moving axle forward lessens wheel-housing bulge in trunk. Lid is wider, deck top squared off, gas tank flattened to lower trunk floor.

NEW ONE-PIECE WINDSHIELD has an almost uniform curve that holds distortion to a minimum. I detected just a little at the upper corners. Electric wipers now park toward center for a better sweep on curved windshield. Tinted safety glass is available for entire window area—at extra cost.

THIS PICTURE ILLUSTRATES something I feel rather strongly about—there's too much chrome gingerbread tacked onto most cars for my taste. This year Plymouth has built the "character lines" right onto the car to point up its contours. But you can get extra chrome if you want it.

THEY'VE PULLED A NEAT TRICK here. In all two-door models the front seat is divided two-thirds on the driver's side, one-third on the other. This young lady, Janet Menard of Plymouth's Planning Dept., showed me how easily she could slide over to let a passenger into the rear seat.

IT'S EASIER TO GET IN AND OUT of rear seat in four-door model now that the armrest has been shifted to door. Back-seat cushion has hip-hugging curve. Door frame is cut back at top for better visibility. The tough plastic door panels should be a boon to fathers of young cowboys.

FACTS ON '53 PLYMOUTH

Model: Cranbrook four-door sedan.

Engine: 6-cyl. L-head; 100 hp. at 3,600 r.p.m.; compression ratio, 7.1:1; piston displacement, 217.8 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 2,040; bore and stroke, 3¼" by 4⅜"; crankshaft bearing surface, 40.6 sq. in.; torque, 177 lb.-ft. at 1,200 r.p.m.

Weight: 3,170 lb. (approx.); per hp., 31.7 lb.

Transmission: 3-speed manual shift (overdrive available). Rear-axle ratio, 3.73:1 (standard); 4.1:1 (overdrive).

Steering ratio: 21.1:1.

Radius of turning circle: 19½'.

Effective brake-lining area: 158 sq. in.

Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height, 62¼"; overall length with bumpers and guards, 189⅛"; width, 73⅞"; wheelbase, 114"; overhang, front 30⅝", rear 44¾"; tread, front 55⅞", rear 58½".

Inside dimensions: seat-cushion width, front 59¾", rear 58¾"; leg room, front 44⅛", rear 42¼"; headroom, front 36⅝", rear 35⅛"; seat height, front 14¼", rear 15⅛"; front-seat adjustment, horizontal 5", vertical 1⅛".

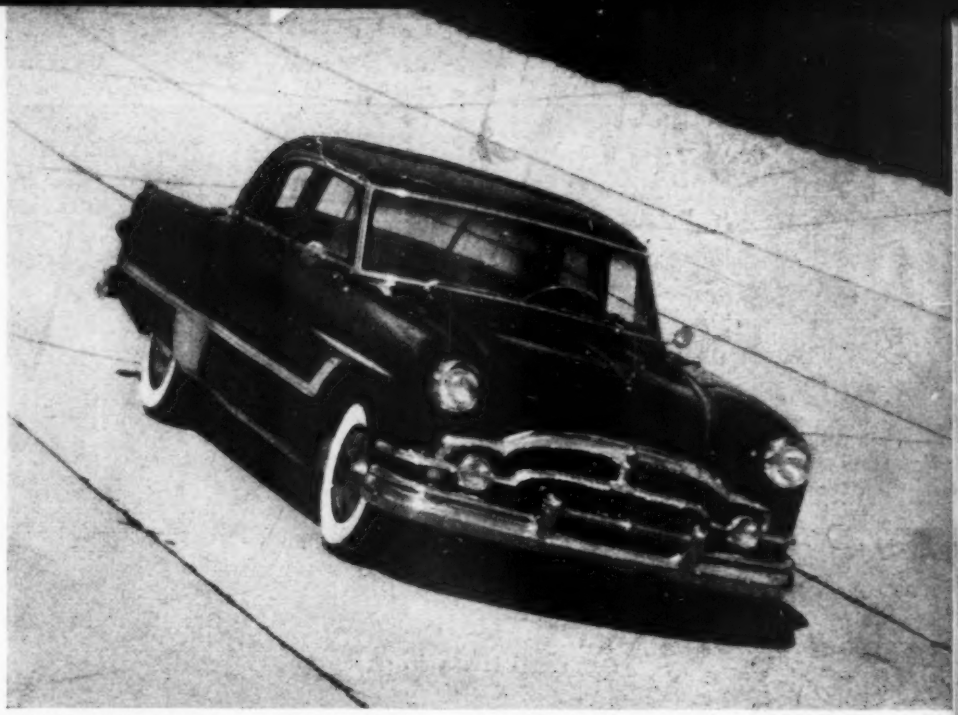
Tire size: 6.70 by 15.

1953 Lincoln Powered by 205-Hp. Engine

TOUCH a button on the 1953 Lincoln and—presto!—the front seat moves forward, backward or up or down without any effort on your part at all. The Lincoln's power-adjusted seat is a tipoff that the car has power to spare—it's the most powerful stock car on the American road. The boost from 154 hp. in 1952 to 205 in '53 is the biggest Detroit has ever witnessed. The car accelerates from zero to 80 m.p.h. in 23 seconds and has a top speed of 112. Among the refinements on the overhead-valve V-8 engine is a new four-barrel carburetor, better manifolding and an exhaust system reducing back pressure. Power steering and power brakes are optional.

1953 DeSoto Goes European in Styling

LIKE the other members of the 1953 Chrysler family, the new DeSoto has a brand-new body, with a one-piece windshield and a wrap-around rear window. A lower silhouette and longer fender lines give the car an appearance of European styling. Mechanically, the DeSoto retains the 160-horsepower V-8 engine introduced in 1952, but continues to offer the six also. A new, squattier carburetor permits a lower hood. A wider frame reduces sidesway, as do rear springs that are "splayed" by toeing in their front anchorages. DeSoto has gone all-out on optional equipment – power steering, power brakes, automatic drive and electric window lifts are all available.



I LIKE THE NEW GRILLE, far superior to 1952's. Note how the top band of chrome suggests the original Packard radiator design. This "headstone" has been retained since 1903.

WILBUR SHAW REPORTS FROM THE DRIVER'S SEAT:

1953 Packard Boasts Simplest Power Steering

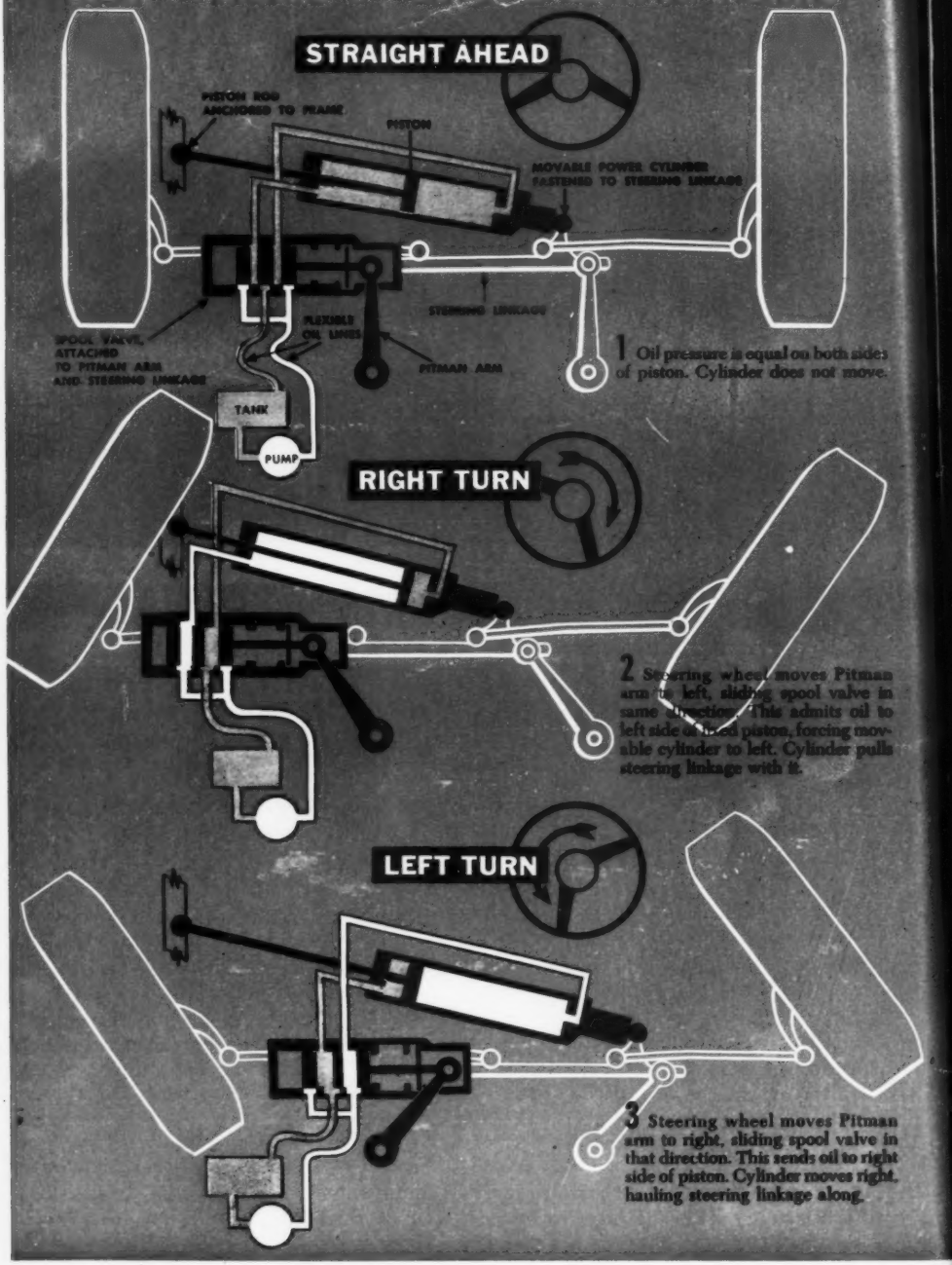
POWER steering and power braking are two of the most intelligent improvements to make in an automobile. Packard now has made them both. It introduced toe-tip braking in its '52 models. It is coming up with fingertip steering for 1953.

Packard is the first of the independents to make power steering available to its buyers (for around $190 extra), and the first of all passenger-car builders to use a type of power steering called direct-acting. This type applies the power directly to the steering linkage. It is simple in design and easy to service. There's no clutter of apparatus, as Packard engineers refer to it, on the steering shaft, where both GM and Chrysler have put their power-steering devices.

I tried out Packard's power steering on a 1953 Patrician 400, a four-door sedan of the company's largest and most expensive line.

The remarkable stability of the front end, even with the effortless steering, was immediately apparent and was still firmly evident at 102 miles an hour, which was as fast as I seemed to be able to

HOW PACKARD'S POWER STEERING WORKS



1 Oil pressure is equal on both sides of piston. Cylinder does not move.

2 Steering wheel moves Pitman arm to left, sliding spool valve in same direction. This admits oil to left side of fixed piston, forcing movable cylinder to left. Cylinder pulls steering linkage with it.

3 Steering wheel moves Pitman arm to right, sliding spool valve in that direction. This sends oil to right side of piston. Cylinder moves right, hauling steering linkage along.

LOWERED CHROME MOLDING makes the 1953 Patrician look closer to the ground. I'm glad the designers got rid of those rear-fender vents some people called "bottle openers."

make the car go. The Patrician handled easily, but there was no looseness about the feel. I was reminded again of the old saying that you don't have to steer a Packard; you just point it.

The engines of Packard's three lines have also been hopped up an extra 10 to 20 horsepower for 1953. Everybody's doing it now, one way or another. Packard did it by shaving down a protruding hump in the ceiling of the compression chamber and adopting a four-barrel carburetor. This combination allows a greater charge of gasoline and air to go into the engine, improving breathing—and performance.

Ambulance Axles Used

To stand the gaff of these livelier power plants, the 1953 Packards will have sturdier rear axles, strong enough to carry an ambulance. The design of the new axles was actually borrowed from Packard ambulances.

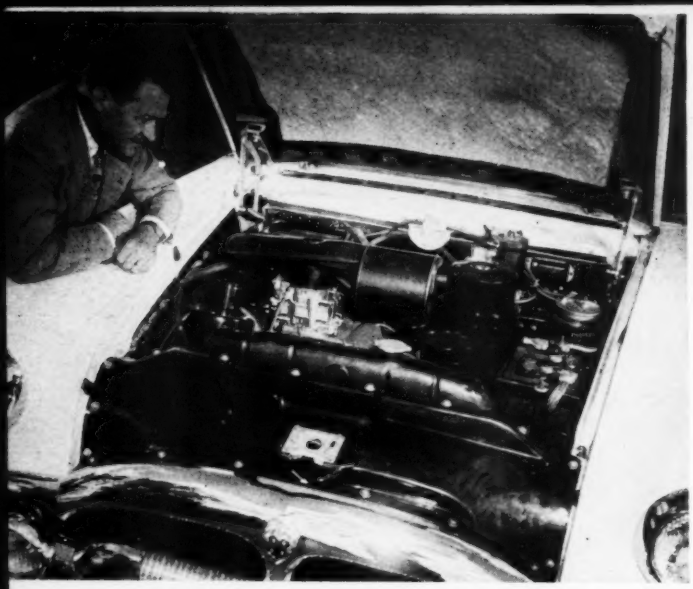
The front end of the running gear in the '53 Packards, except for the steering mechanism, has been insulated from the frame by rubber-cord bushings. This makes a famous soft ride softer still.

Apart from where the apparatus is located, the chief difference between Packard's power steering, on the one hand, and GM's and Chrysler's, on the other, is in the order in which actions take place.

When you turn the steering wheel of any Packard, the movement immediately causes the Pitman arm to turn, and the Pitman arm then moves the steering link-

"IT'S GOT SLIMMER HIPS," I said when I got a good look at the rear of the 1953 Patrician. But I found that design tricks were responsible. It's really as broad and heavy as ever.

A RESONATOR HAS BEEN ADDED to the exhaust system. This gadget takes the pulsations out of the sound of a combustion engine's exhaust and gives it the swishing sound of a jet.



GLASS-FIBER PAD under the bonnet is new. It is primarily to insulate the paint from engine heat. (One rival manufacturer of luxury cars found that his engines were actually blistering the paint.) But the pad has the additional advantage of deadening engine and body noises.

At left rear you can see Packard's new four-barrel carburetor, partly responsible for the boost in horsepower that the 1953 lines offer.

At right front is the top of the one-quart reservoir that holds oil for the power-steering system. This tank, containing a filter, is right over the pump.

age. This is conventional in automobiles.

When the Packard is equipped with power steering, however, at the same time that the Pitman arm starts to move the steering linkage it also moves a sliding-spool control valve attached to both. This valve instantly sends oil under 650 pounds' pressure to a power cylinder fastened at one end to the steering linkage and at the other to the frame of the car. The piston in this cylinder is fixed, anchored to the frame. Therefore the cylinder itself moves to the left or right, depending on which end is feeling the thrust of the oil pressure, and pulls the steering linkage in the same direction. It gives a powerful boost to the movement begun by the Pitman arm.

Now, in the case of GM's power-steering mechanism and of Chrysler's (PSM, April '51, p. 126), though they differ in detail, the boost is applied to the Pitman arm, which proceeds to move the steering linkage just as it does normally. On their power-steered cars (Cadillac, Buick, Oldsmobile, Chrysler, De Soto), when you turn the steering wheel you trigger the control valve, which directs oil pressure against a movable piston within a fixed cylinder. The movement of the piston assists the me-

[Continued on page 238]

FACTS ON '53 PACKARD

Model: Patrician 400.

Engine: straight-8 L-head; 175 hp. at 3,600 r.p.m.; compression ratio, 7.8 to 1; piston displacement, 327 cu. in.; bore and stroke, 3½" by 4¼"; piston travel (in feet per car mile at 20 m.p.h.), 1,795; crankshaft bearing surface, 30.7 sq. in.; torque, 300 lb.-ft. at 2,000 r.p.m.

Weight: 4,125 lb.; per hp., 23.6 lb.

Transmission: Packard Ultramatic; rear-axle ratio, 3.54:1 with automatic transmission (standard on this model).

Power steering: 4 turns lock to lock; radius of turning circle, 21½'.

Effective brake-lining area: 208.25 sq. in.

Springs: front, coil; rear, leaf.

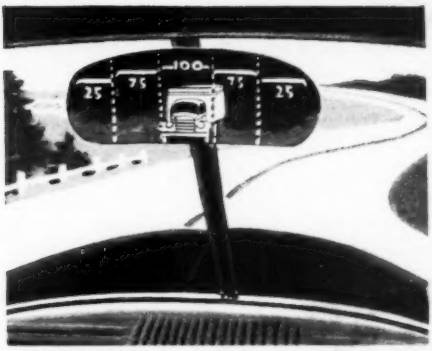
Outside dimensions: height, 62 29/32"; over-all length with bumpers and guards, 218 5/32"; width, 77⅞"; wheelbase, 127"; overhang, front 36 31/32", rear, 54 5/32"; tread, front 60", rear 61 7/32".

Inside dimensions: seat-cushion width, front 62¾", rear 62"; leg room, front 43½", rear 48¾"; headroom, front 36", rear 35 3/16"; seat height, front 14", rear 13 27/32"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 6"; front-seat adjustment, horizontal 5", vertical 1".

Tire size: 8.00 by 15.

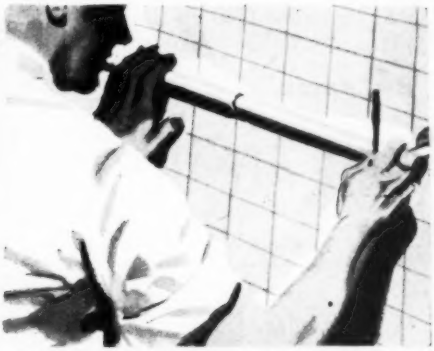
I'd like to see them make . . .

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



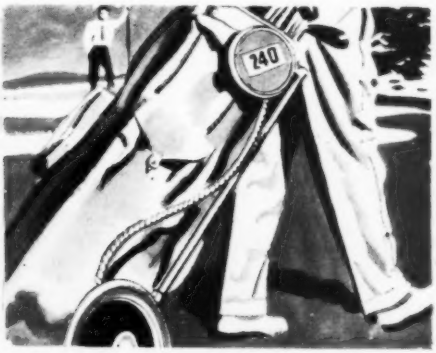
A REAR-VIEW MIRROR that was marked off in such a way that you could tell roughly how many feet behind you the next vehicle was following.—*W. R. Brown, Hornell, N. Y.*

A BOOK OF ROAD MAPS with a compass in the cover so a motorist could be sure he was not only on the right road but traveling in the right direction.—*Roy Chisholm, Jackson, Mich.*



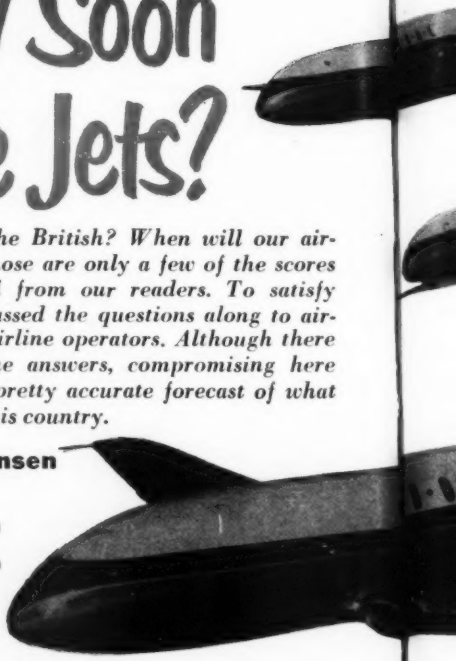
ADJUSTABLE TOWEL RODS that could be extended like curtain rods to exactly the right length and attached securely to the wall studs. —*Mrs. Bessie Combs, So. Zanesville, Ohio.*

A SHIRT with sleeves that would snap on and off to transform it quickly into a sports shirt, and do away with rolling up and rumpling sleeves.—*Alan Steger, Huntington, N.Y.*



A GOLF CART with a meter that would register in yards to enable a golfer to judge the length of his strokes and the distance to the green. —*Edward Conklin, Farmington, Conn.*

QUESTION: How Soon Will You Ride Jets?



Why don't we have a jet passenger plane like the British? When will our airlines have jet planes? What will they be like? Those are only a few of the scores of questions about jet transports we've received from our readers. To satisfy their interest and curiosity (and our own), we passed the questions along to aircraft manufacturers, aeronautical engineers and airline operators. Although there were disagreements, we were able to combine the answers, compromising here and there, to come up with what we believe is a pretty accurate forecast of what the future holds for commercial jet transport in this country.

By Andrew R. Boone and Herbert O. Johansen

Here Are the ANSWERS:

Q ***When will U. S. airlines have jet-powered passenger liners operating?***

A By 1958 at the earliest—on long-range runs—although a limited number may be flying before that.

Q ***How fast will they fly?***

A About 600 miles an hour—perhaps 650 tops. Supersonic airliners are probably 15 years off.

Q ***Will they be able to fly the Atlantic nonstop?***

A The first commercial jets will undoubtedly go into long-range, luxury service. Certainly they will be able to fly the Atlantic nonstop eastbound. Westbound, with severe unfavorable winds, may require one stop.

Q ***How high will they fly?***

A At 40,000 feet—or even higher, up to 50,000. That is because the jet engine is most efficient at high altitude. It means rapid climbs to altitude and rapid descents for landings.

Q ***Will they differ much in appearance from the airliners flying today?***

A Not so far as the fuselage or body of the plane is concerned. Greatest difference will be in the wing, which will be swept back 35 or 40 degrees, much like the wing of the Boeing B-47 Stratojet bomber. And, of course, there won't be any propellers.

Q ***How about the jet engines, where will they be located? How many?***

A Suggestions have been made for locating the engines (probably four) in the fuselage itself, in the wing, or suspended in pods beneath the wing. Pods probably will be adopted for several reasons. That would lessen fire haz-

Q ***Okay, but why wait for 1958—when the British already have the jet Comet in service? Why don't our airlines buy Comets?***

A The de Havilland Comet is a good experiment in jet transport, but it is uneconomical to operate. Our airlines don't want it because it is too slow (about 490 miles an hour); it doesn't seat enough passengers (36); its engines burn too much fuel. It is true that the British are developing Comet II and a Comet III, which will be faster and larger. A few months ago Capt. E. V. Rickenbacker, president of Eastern Air Lines, flew to England waving $100,000,000 to buy himself a fleet of Comets III. He came home with his money unspent. Pan American World Airways' Juan Trippe, a more modest shopper, had slightly better luck. The British sold him just three Comets III, not to be delivered for four years. By that time (barring war), our airlines may be able to buy jets made in the U.S.A.

ards, for it must be remembered that the greater part of the length of a jet engine is one continuous hot flame; structure of the plane would be less vulnerable in case turbine blades, whirling at 1,000 miles an hour, should break; it would lessen noise for the passengers.

Q ***What kind of ride will jet give us?***

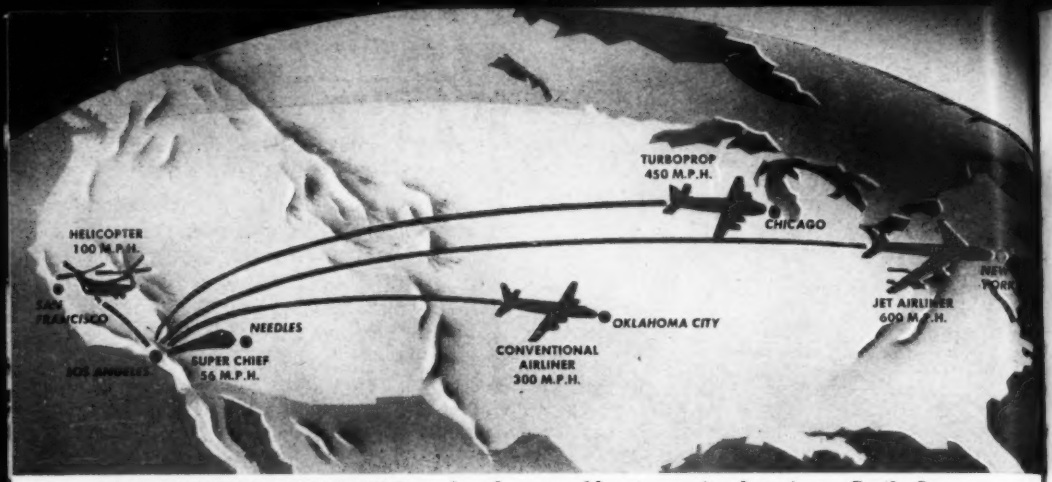
A It will be fast, therefore less fatiguing because you'll be in the air a shorter time. Flights will be less bumpy because the swept-back wing will unload gusts faster. There will be practically no vibration and much less noise.

Q ***How is it that the British can afford to fly this uneconomical Comet?***

A As British airlines are government owned, they can afford to operate a limited number of jet transports at a loss to gain operational experience (from which we will profit) and to bring prestige to British products.

Q ***But how come we haven't built even an experimental jet transport?***

A Military priority is probably the main reason. Just about 100 percent of research and development on jets in this country, the building of airframes, engines and accessories, has been for the



CROSS-COUNTRY IN FOUR HOURS is goal set by U.S. airlines for jet transport. Map above shows where train and other types of planes would get you in that time. Crack Super Chief train is tortoise in this race—it makes four stops, has to climb steep grades.

Air Force and Navy air arm. The requirements of a military jet and a commercial jet are about as far apart as those of a tank and a civilian automobile.

And with military orders keeping them busy, airplane manufacturers have been reluctant to expand and gamble the $30,000,000 to $40,000,000 estimated as the cost of producing a flying prototype of a commercial jet airliner.

Q *Has Britain's achievement changed this attitude?*

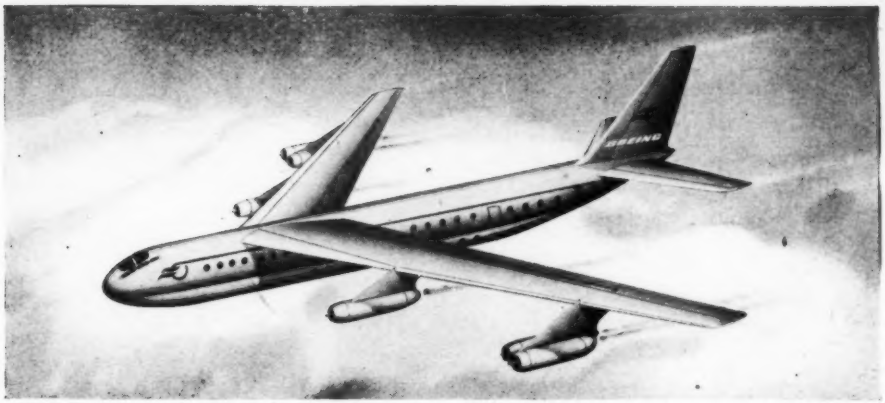
A Yes. It looks as if a years-long stalemate is about to be broken. The manufacturers have been marking time, keeping their hands in with engineering studies and drawings of a jet transport, but waiting for the airlines to come through with orders before going ahead with actual construction. The airlines, on the other hand, have been more or less waiting for a flying prototype to be handed to them on a platter. Now, with the British Comet and its world-wide publicity, U. S. manufacturers realize that they'd better get on the ball. And U. S. airlines are indicating that they are ready to buy American jets—if they can get what they want. The president of one of the big U. S. airlines said recently: *The Douglas DC-7 and the Lockheed Super Constellation will probably be the last of the large transport aircraft with reciprocating engines. After them will come the jets.*

PASSENGERS aboard British jet Comet are able to balance cards and cigarettes in flight, demonstrating the absence of annoying vibration. Jet flight is also less noisy.

Q *And what are the aircraft manufacturers doing about it?*

A Getting into the act, according to recent announcements of three of our leading manufacturers of commercial air transports:

- Boeing claims that it will have a jet transport, suitable for commercial needs, ready for flight testing in the summer of 1954. Boeing will undoubtedly draw healthily on its experience in designing and building the B-47 and B-52 military jet bombers. Two versions are contem-



A SIX-ENGINE JET AIRLINER as visualized by Boeing engineers. Swept-back wing is borrowed from the company's B-47 Stratojet bomber and fuselage is reminiscent of the new Boeing eight-jet heavy B-52 Stratofort. Other plane makers also have jet designs.

plated, one domestic and the other for international service. They will seat from 60 to 97 passengers.

• Douglas is staking $40,000,000 on putting a commercial jet in the air—a four-engine DC-8 powered by 15,000-pound-thrust engines. Again there will be two versions, according to plans, carrying from 70 to 120 passengers. Douglas has a full-scale mockup of the proposed DC-8 to sell prospective airline customers—U. S. and foreign.

• Lockheed has publicly offered a $2,500,000 commercial jet transport. Says a company spokesman, "Lockheed has had discussions with airlines about a jet transport . . . It would have a substantial performance margin over any existing jet transport in speed, range, passenger comfort, and above all, *in cost per seat mile.*"

Q *Why doesn't our military experience permit us to switch to commercial jets right away?*

A There's a lot of difference between military and commercial jet airplanes. One is fuel consumption. Although a great deal of progress has been made in the 10 years of jets, the engines still are too thirsty for the airlines' pocketbooks. A lot of research is now going into this problem, and various solutions are in sight.

Q *Are the airlines ready, otherwise, to fly jets?*

A Not yet. There are also some tough operational problems to solve.

Q *For instance?*

A Longer runways is one. Military jets have longer runways than are available to commercial planes. The airlines would like a jet that can take off and land at any of the big civilian airports.

Q *But don't military jets sometimes use civilian airports?*

A Yes—but military jets have assists that are not considered practicable for civilian use. Jet power is inefficient at low take-off speeds. The military uses the added boost of rockets to get them up in the air. Rockets are both noisy and create a lot of smoke. The latter nuisance has been licked, though, by a new 4,300-pound-thrust British Sprite rocket. Tried on the Comet, it left no smoke trails.

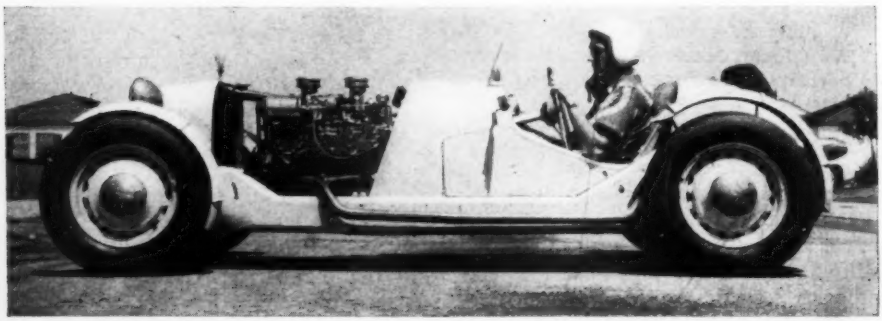
How to shorten landing runs is an even more serious problem. In conventional airplanes, you can reverse the propellers to act as brakes. With jets, the military shortens landings by releasing a drag parachute at the tail. For commercial jet, it is generally agreed that

[Continued on page 240]

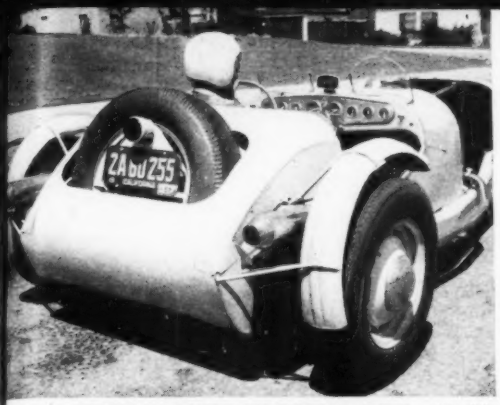
Aircraft Engineer Builds Sports Car Like a Plane

WHEN he set out to build himself a sports car, C. G. Manning decided to apply some of the principles he had learned as a structures engineer at the El Segundo, Calif., plant of Douglas Aircraft. Using glass fiber for a body of maximum rigidity and minimum weight, powered by a Mercury motor hopped up to 180 horsepower, he forged a four-wheel thunderbolt that tips the beam at a buoyant 1,615 pounds—almost 300 less than a 54-hp. MG.

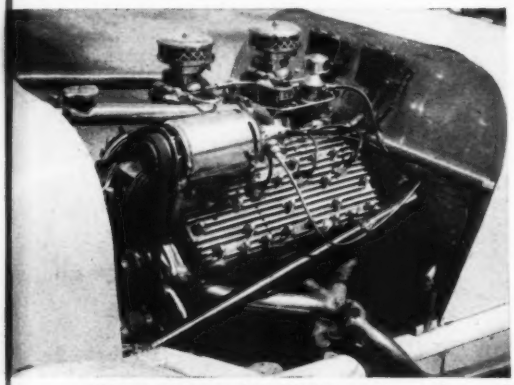
In nine months he has raced his Manning Meteor to third spot in the national sports-car championship.



LIGHT YET TOUGH, Meteor's body is 10 times as strong as average sports car's, Manning claims. Wheelbase is 100 inches, length 133 inches. Hood is off here to show engine.



SQUARE CORNERS ARE EASY TO TAKE in this 33-inch-high road hugger. Front and rear axles are Ford. Tailpipes, packed with glass fiber to cut noise in town, are cleaned out for racing.



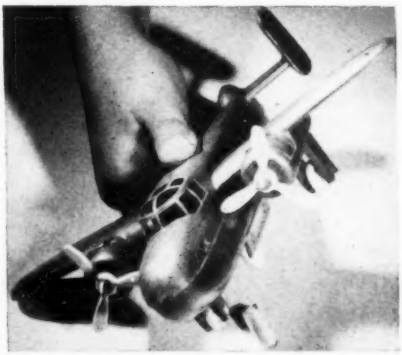
HIGH-COMPRESSION HEADS, twin carbs and special cams upped the output of this Merc mill to 180 horsepower to boost car to 130-m.p.h. speed on half-mile straightaway.

INSTRUMENTS include tachometer, manifold-pressure gauge. Steering assembly is Ford.

Dutchman Builds "Saucer"

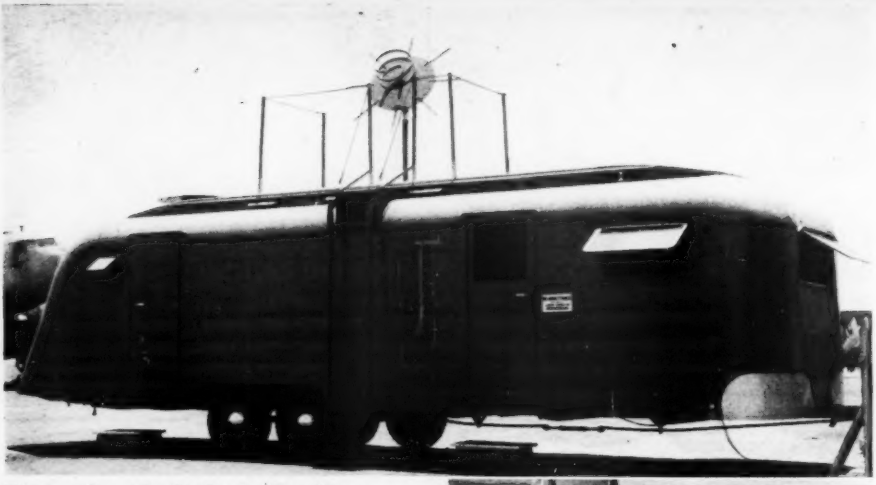
EUROPEAN model-plane makers have been bitten by the flying-saucer bug—Claude R. De Vries of Rotterdam built the lightwood one above.

Powered by two Jetex engines, it does its spinning 200 feet up. An Italian model about the same size (PSM, Oct. '52, p. 132) hit 87 miles an hour.



Bombs Away!

WHEN the blister dome on top of this plastic toy bomber is pressed, two bombs drop from its two-door bomb bay. Modeled after a B-25 Mitchell, the plane is made by Ideal Toy Corp., 200 Fifth Ave., NYC. Price: about $1.00.



Plane Sends Data to Trailer

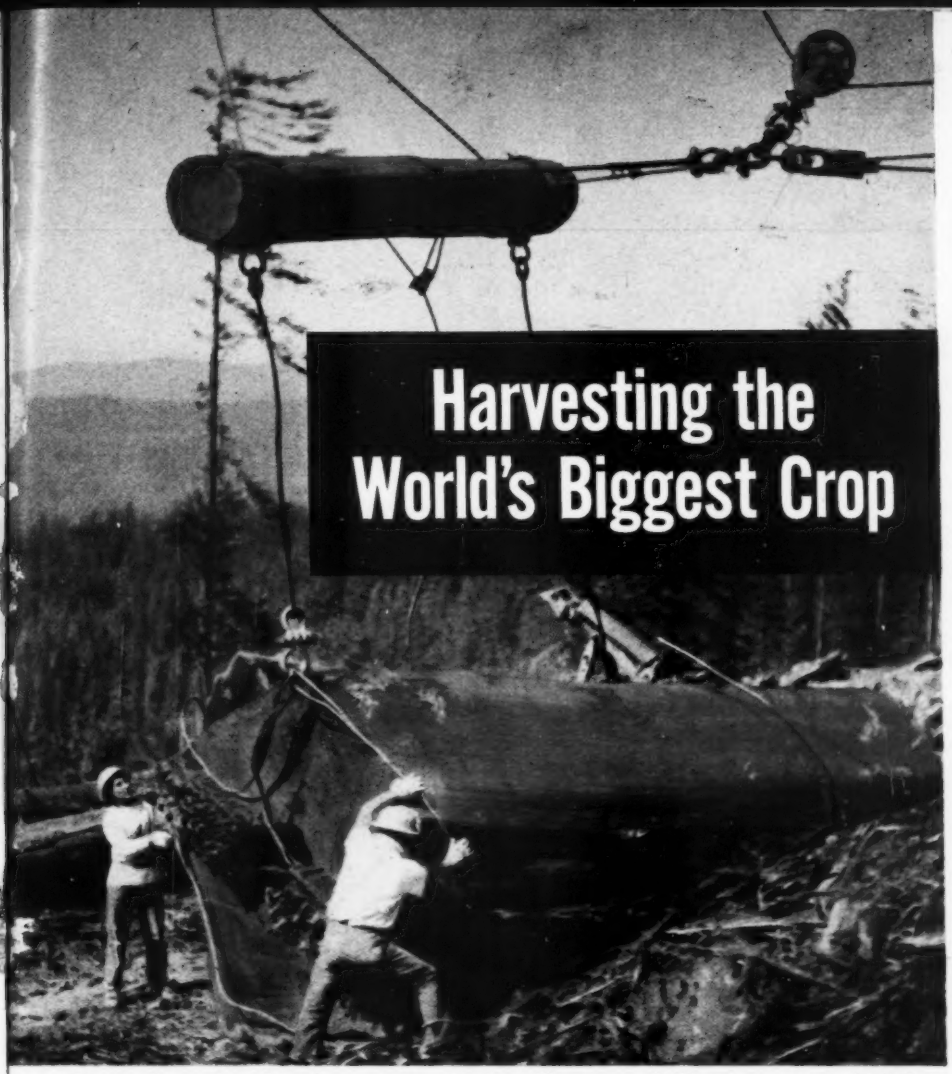
SEATED before twin scopes in a trailer (right), engineers follow what's going on in supersonic planes under flight test. Data transmitted by radio from 176 measuring devices in the plane show up as lines on the scopes. An automatic analyzer translates the lines into air speed, engine temperature and other information. Engineers can immediately order a pilot to repeat tests or caution him to slow down. Douglas developed the 110-pound airborne equipment.

Umbrella Has a Window

THIS umbrella lets a gal see what's ahead in foul weather. The Vinylite plastic window is said to resist abrasion and to take repeated foldings without cracking or creasing. The Rainseth Umbrella Co., 26 West 31st St., NYC, makes it.

Pencil Tells Time, Too

JOTTING down notes with one eye on the clock is no trick for appointment-conscious salesmen and secretaries equipped with this pencil watch. The gold pencil is engine-turned and the watch movement has 17 jewels. Made in Switzerland, it costs $150.



Harvesting the World's Biggest Crop

Twenty-foot redwood log is eased to earth after ride across a California canyon on high line.

Selective cutting, tree farms and new processing methods add up to a constant supply of redwood.

By Andrew R. Boone

THE biggest crop in the world isn't wheat or cotton or corn. The biggest—literally—is a tree, the gigantic redwood. One of these is the tallest tree in the world, rising 364 feet into the air. A single redwood can provide enough lumber for more than 20 homes. An acre of redwoods has been known to yield a million board feet of lumber, 40 times the average production of other forests.

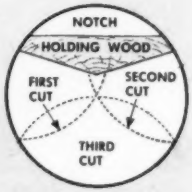
And today, say the redwood lumbermen, their giant trees are really a crop, one that can be harvested over and over again, like any farm product. That's something new. In the past, we've treated the redwoods more like a mineral to be

1 SELECTIVE CUTTING enables redwoods to be grown like farm crops now. Redwood-expert Prof. Emanuel Fritz (above) marks a tree for harvest at the Van Duzen tree farm.

2 FIVE-FOOT CHAINSAW BITES into a 12-foot-thick redwood, will fell it by cuts shown in diagram at bottom of page. Here, notch is being made in side toward which tree will fall.

5 TIMBER-R-R-R! Tree as tall as a city block is long crashes down an alley. "Widow makers"—big limbs near top—fly end over end as giant smashes limbs off other trees.

6 THIS REDWOOD WAS FELLED by a dragsaw making two cuts, a wedge and a final slice. Note shattered holding wood. Now branches will be cut off and the trunk sawed into logs.



HOW A FIVE-FOOT CHAINSAW can fell a nine-foot tree: Notch is first cut on side toward which tree will fall. Then three sweeping cuts are made on opposite side.

mined, snatched from the ground once, never replaced.

In a century we've lumbered off a third of the original redwood forests. If we kept on cutting the present half-billion board feet a year without thinking of the future, the remaining redwoods would be gone in another 60 years.

Expert Says Industry to Continue

But listen to Prof. Emanuel Fritz of the University of California, who knows so much about the forest giants that lumbermen call him "Mr. Redwood." He

3 LARGER DRAGSAW is still often used, as on redwood above. Gasoline engine drives an eccentric, which pushes and pulls the blade back and forth like a handsaw.

4 LUMBERJACKS USE SLEDGES to knock wood blocks out of notch cut made with a dragsaw. Dragsaw blade is held firmly against tree by spring tension of bar driven into trunk.

7 WHEEL CATS—tractor and trailer both on cat treads—snake logs to gathering area, called a landing. From landing they are carried by truck or logging train to sawmill.

8 LOGS CAN BE STORED in water or stacked on land. Butt logs—cut from base of trunk—are too dense to store in water because they sink. These "sinkers" are taken by rail to mill.

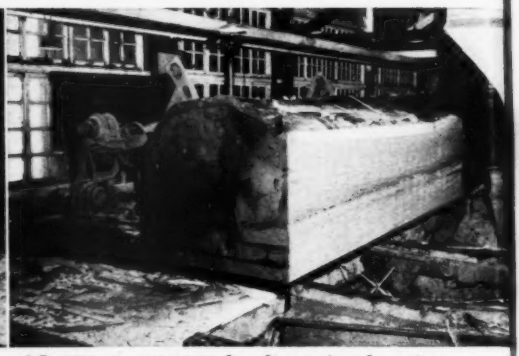
says, "The redwood-forest industry will continue forever"—thanks to limitation of the annual cut, the use of more second- and third-generation trees, and extension of the tree-farm system.

Professor Fritz, an adviser to the California Redwood Association, explains: "As industry uses more and more of a tree for various products, from synthetic boards to chemicals, it finds it can use trees that are both smaller and of poorer quality."

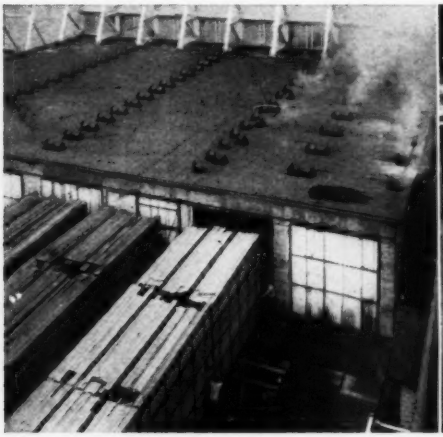
Already the lumberjacks are cutting trees three feet thick that are 70 to 100 years old. That's the redwood equivalent of new-born lamb; some redwoods are more than 2,000 years old. And lumbermen are encouraged because new growth often yields more board feet per acre than the original forest.

Today everything is used. The narrow boards from smaller trees can be edge-glued into strong wide planks. Powdered redwood chips are being processed experimentally into a plastic. Even the bark, which is sometimes a foot thick, is valuable for sound and heat insulation. Exploded bark fibers are used to seal

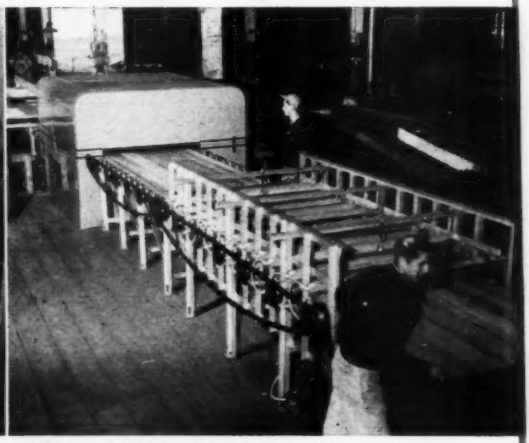
9 BARK IS PEELED from logs, either by hand as above, or mechanically. Thick coat enables redwoods to repel insects and diseases, live for centuries. Bark has many uses.



10 LOG IS SQUARED for dimensional sawing after de-barking at Pacific Lumber Co. mill at Scotia, Calif. Traveling carriage moves log back and forth into bandsaw.



11 CURING IS IMPORTANT. Above, lumber cut to size rolls into drying kilns where it will bake for six days in temperatures rising from 100° to 175°.



12 WIDE BOARDS ARE MADE of narrow ones by electronic gluing of edges under heat and pressure. This is one new way smaller trees are used.

crevices in oil wells, and a redwood-bark chemical called sodium palconate is now being used to control the viscosity of oil-well drilling mud.

Trees Grow Faster on Farms

The development that is changing cut-and-move-on lumbering into regular crop harvesting is the tree farm—an area from which only selected logs are cut. The first redwood tree farm was established in 1941; now there are 11 operated by private industry.

Professor Fritz's study shows that on these farms growth accelerates almost miraculously. He points to a group of 20 trees whose ages he recorded as evidence of what thinning the dense growths can do. Although all were the same diameter—12 feet—they ranged in age from 550 to 2,200 years.

Redwood is highly valued because it works easily, retains its shape and grips paint. And it resists rot and weathering as few other woods can. Thanks to the tree farms, it looks as if it will also live up to its botanical name, *Sequoia sempervirens*—"forever-living Sequoia." END

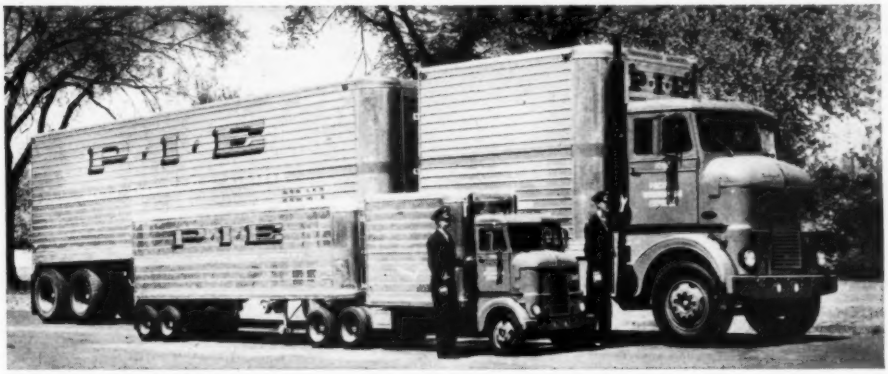
Scrap Pile and Yank Know-How Give GIs a Mobile Stairway

THIS stairway, for loading passengers on planes, was built by GIs in Korea strictly from scrap. Lumber was salvaged from a wrecked bridge; iron to hold the treads was cut from a bombed-out hangar; pipe railing was fished from the Han river.

The steps ride from field to field semipermanently mounted on a jeep. Warrant Officer Lloyd G. Lewis sparked the Combat Cargo Command project.

Fins Boost Ferry's Speed

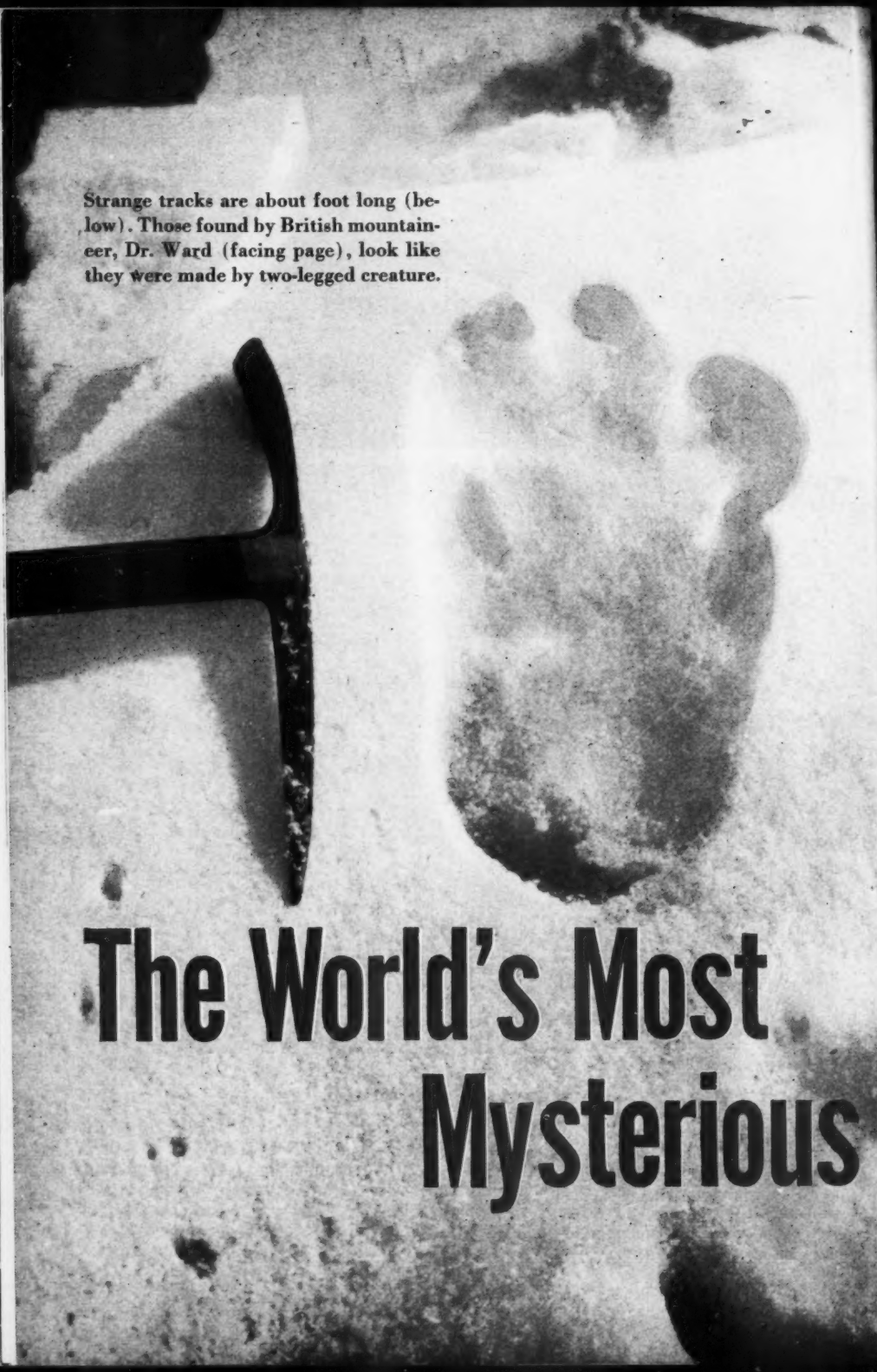
THIS German boat glides along on two steel outboard fins. With bow lifted high enough to show daylight beneath, the boat meets less drag from the water, hits 48 m.p.h. A U. S. boat with fins at bow and stern (PSM, Oct. '52, p. 157) made 35 with an outboard motor.



Baby Trailer Checks Students' Driving Skill

THIS half-size trailer rig is powered by a jeep engine. It has dual drive, two transmissions giving nine forward and three reverse speeds, and air brakes. Rolling along on midget-racer tires, it travels to high schools carrying equipment used for testing professional truck drivers.

The electronic devices are set up at the roadside, and students seated before them check vision and reflex actions. The equipment measures in split seconds how long it would take a "driver" to put on the brakes or to turn on a given signal if he were really driving for Pacific Intermountain Express.



Strange tracks are about foot long (below). Those found by British mountaineer, Dr. Ward (facing page), look like they were made by two-legged creature.

The World's Most Mysterious

They belong to the Abominable Snowman, which may be monkey, bear—or cave man. New Everest expedition hopes to find out.

Footprints

By Gardner Soule

WHAT—or who—makes the naked, manlike footprints in the snow near the tops of the world's highest mountains?

The mystery, which has stumped the experts for 30 years, may be solved in 1953. Next May Britain's Royal Geographic Society, which has sponsored nearly all Himalayan exploration, is sending another expedition back to tackle Everest. These climbers hope to see and identify the mysterious creature they call the Abominable Snowman.

Ever since 1921, climbers approaching the peaks of Mount Everest and other Himalaya mountains have been startled by what look like human footprints in the snow. The prints are found four or five miles high, where the temperature is often 25 below. Yet no mountaineer has ever seen, even fleetingly, the creature that makes the tracks.

The Snowman has many names. The Himalayan natives call it Yeti, Mirka,

Tracks Made by Some Animals Are Like Snowman's—

SMALL LANGUR MONKEY has a left hind foot that makes track in wet sand like this. The print, however, is only 6⅞ inches long—five to six inches shorter than tracks on Mt. Everest.

SMALL BEAR TRACK shows imprint of right hind foot superimposed on print of forefoot—a phenomenon that might cause bear's trail to look like that of two-legged beast.

ANOTHER BEAR TRACK—of right hind foot alone—looks like this. This track was made by a black bear, not known ever to appear as high up as four miles in Himalayas.

Metchkangmi—or in pidgin English, Bad Man-shi. Different scientists have "definitely identified" it as a wolf, black bear, red mountain bear, snub-nosed monkey, langur monkey and great ape.

Among the natives there is no such variety of opinion. Several claim to have seen it. They say it is a man. A wild man covered with thick hair; a cannibal who also eats sheep, oxen and yaks. A man with an evil face, teeth like fangs, toenails like claws. A man who can jump by huge bounds and run like lightning over the mountains.

It's Real, All Right

The Snowman definitely exists. The British mountaineers have photographed and measured its tracks.

The first European to report the mysterious tracks was the first Everester of them all, Lt. Col. C. K. Howard-Bury. He startled British scientists in 1921 with the news that his expedition had discovered at 21,000 feet "the track of what was probably a large, loping gray wolf, which had tracks very like those of a barefooted man."

The latest report on the Snowman comes from Eric Earle Shipton, current champion among Everest climbers, with 12 trips to the Himalayas behind him.

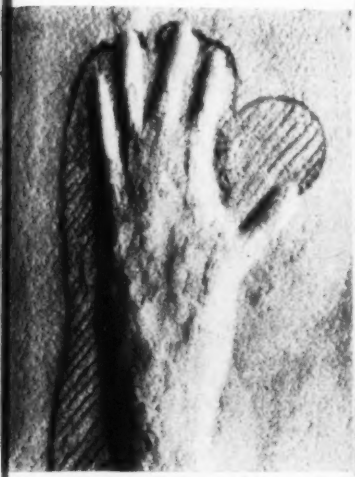
"I have come across many of these tracks in various parts of the Himalaya and the Karakoram," Shipton says.

Only last year on a glacier 19,000 feet high he saw the spoor. "On November 8, 1951, at four o'clock, we came upon strange tracks in the snow. What was particularly interesting was that where the tracks crossed a crevasse one could see quite clearly where the creature had jumped and used its toes to secure purchase on snow on the other side.

"We followed the tracks for more than a mile down the glacier before we got to the moraine- [rock-] covered ice."

The tracks, Shipton reports, were about 12½ inches long, and broader than a mountain boot. Shipton's photographs

But Not Exactly



LARGER LANGUR makes track like this plaster cast, here placed over lines resembling the mysterious tracks. The langur, never yet seen near mountaintops, is at right.

of the tracks appear with this article.

Between Howard-Bury in 1921 and Shipton in 1951, many other Everesters saw the tracks.

Frank S. Smythe came upon the tracks in the Himalayas in 1937.

"I saw the imprint of a huge, naked foot," he said, "apparently of a biped and in stride closely resembling my own tracks." The stride was 1½ to two feet long, Smythe said; the tracks 13 inches long.

A Talented Creature

When Smythe followed the tracks downhill he was amazed: "An expert mountaineer could not have made a better route and to have accomplished it without an ice axe would have been both difficult and dangerous." (Difficult and dangerous is a mountaineer's phrase for the hardest kind of climb or descent.)

"Obviously," Smythe continued, "the Snowman was well qualified for membership of the Himalayan Club!"

Smythe's photographs were examined by a number of British scientists, including the famous biologist Julian Huxley. Conclusion: the tracks were made by a bear. The fact that they appeared to be made by a biped was explained by the bear's putting its rear feet into the rear ends of the impressions left by its front feet.

Eric Shipton also saw the tracks in 1937 elsewhere in the Himalayas.

"The tracks I saw were certainly not bear tracks. They were all in one line and not staggered right or left of a central axis, as in the case of four-legged creatures."

After Shipton's 1951 report of the tracks got back to London, the world-famous London Zoo trotted out some Himalayan bears and monkeys and had them make tracks in wet sand.

The snub-nosed monkey, however, appeared to be too light to break the snow and make the tracks. The bear tracks were not the right size; besides bears

are seldom seen outside of the valleys.

That left the langur monkey. Shipton answered this one: "The tracks measured rather more than 12 inches, which would suggest that they had been made by a creature larger than any langur known.

"I understand that langur monkeys are vegetarians. Now while a carnivorous creature might feed upon marmots and tailless Tibetan rats which inhabit the lower reaches of these glaciers . . . a vegetarian, other than a grazing animal, would in these parts be very far from adequate food supplies.

"What in any case is a monkey doing in these regions of permanent snow?"

What about an ape? Most apes live in tropical forests in flat regions. There is, however, a mountain gorilla. The trouble is he lives 5,000 miles from Everest in the Belgian Congo.

Eyewitnesses Agree

There are records of two Europeans —neither one a Himalayan mountaineer —who assert they saw the Snowman. They agree with the natives.

Stanley Snaith, in his book *At Grips with Everest,* tells about the first:

"Years before the Everest expeditions a traveler (in Tibet) named Hugh Knight told of a strange being he had encountered on a mountain slope: a creature with a face of a Mongoloid cast, splayfooted (that is, with feet that are flattened or spread out), with the crouched shoulders and thick mane of a gorilla, leaping with marvelous sureness from rock to rock. It carried a primitive bow."

Native Expert Saw One

Frank MacIntyre, in his book *Attack on Everest,* tells of the other:

"An Italian named Tambazi claimed encounter with the Troglodyte . . . Near the Kabur mountain, he said he saw a wild man . . . moving swiftly on the mountain side. He examined it through powerful glasses, saw that it was manlike, walking upright, naked, covered with hair; stooping occasionally to tear up roots." Tambazi found a footprint. It was like that of a man, and spread outward at the toes.

The most authentic native report comes from a Sherpa named Sen Tensing, a Himalayan porter so famous for his reliability that last May he was allowed to accompany the Swiss climber Raymond Lambert all the way up to 792 feet from the summit of Everest—the highest point mountaineers have successfully reached.

[*Continued on page 242*]

MOST PUZZLING PHOTO of all, taken in 1937, shows that Abominable Snowman made an excellent descent down treacherous slope. This would be a feat for experienced mountaineer.

New Ideas from the Inventors

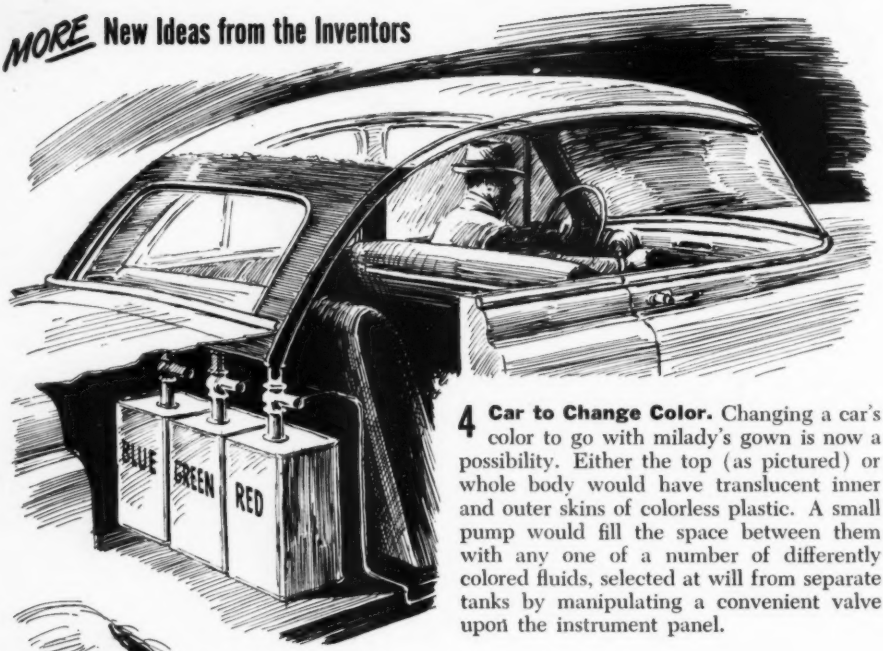
1 "Flippers" to Stabilize Plane. Here may be a preview of a coming style for big aircraft. Ahead of the main wings would be these stubby ones, pivoting freely on a common shaft and adjustable by trim tabs. They would help maintain balance and lift when main-wing flaps are extended for landings and take-offs, and could be retracted at other times. The inventor is the head of a leading aircraft-building firm.

2 Sight to Aim Slingshot. Youngsters would use an automatic sight to aim a slingshot of this improved design. When a missile was placed in the elastic band and drawn back, a pull-string would raise a central rod into position for sighting at a target. Upon release of the missile, the rod would automatically drop out of its way.

3 Hammer to Prevent Rebounding. Heavy blows with this hammer wouldn't cause it to bounce back. Nearly filling the hollow head, loose and irregularly shaped particles of hard steel or brass would make up its weight. Upon impact, the inventor says, they would pile up and deliver a recoilless and prolonged blow.

Please turn the page for more new ideas.

MORE New Ideas from the Inventors



4 Car to Change Color. Changing a car's color to go with milady's gown is now a possibility. Either the top (as pictured) or whole body would have translucent inner and outer skins of colorless plastic. A small pump would fill the space between them with any one of a number of differently colored fluids, selected at will from separate tanks by manipulating a convenient valve upon the instrument panel.

5 Pad to Contain Instant Inhalant. Dip this packet in water for 10 seconds, place it on a plate, and it would emit a vapor to be inhaled for treating a cold. No boiling water would be needed. Instantly ready for use, the packet would contain chemicals that interact when wet and liberate heat.

6 Bell to Ring on Christmas Tree. Designed to add tinkling sound to a Christmas tree, this invention combines a tiny bell with a solenoid-operated plunger and cord to swing and ring it. It would include a flasher to keep the bell swinging, and could fit a Christmas-tree-lamp socket.

Patents on these inventions have been granted to: 1. Donald W. Douglas, Santa Monica, Calif.; 2. Willis O. Fernsel, Los Angeles; 3. Johannes W. Kahlen, West Vancouver, B. C.; 4. Harry L. Lacy, Philadelphia, and Mount L. Lacy, Dundalk, Md.; 5. Austin P. J. O'Grady, Lindfield, N. S. W., Australia; 6. Edwin J. Nicorvo, Morgan, N. J.

Model shows two huge concrete bridges that will help to straighten out Los Angeles traffic.

Los Angeles Prepares for More Traffic

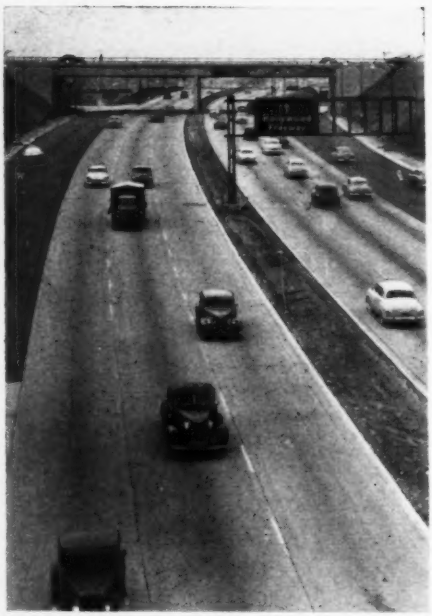
With the densest car population of any large city in the world, it is spectacularly building a way out of present and future jams.

By Wesley S. Griswold

LOS ANGELES has grown up with the automobile. Now it is showing all other large cities how to avoid being strangled by traffic.

The people of Los Angeles own 2,000,000 cars—one for every two of them. To avoid the world's biggest traffic jams, city planners realized several years ago that they had to do something drastic. In 1946 road engineers designed a spectacular network of speedways that would enable heavy traffic to move quickly across the city's 452 square miles and would take care of all the cars the future was likely to bring to town.

Thirty miles of those roads, which at one interchange are stacked four deep, are now in use, carrying more than 200,000



TEN-FOOT STRIP divides the four-lane, one-way halves of the Hollywood Freeway. In addition, black-topped, six-foot parking strips are provided for drivers that run into car trouble.

cars a day. Already the improvement in traffic conditions is striking. Seventy additional miles of speedway are being built. Eventually five major and 23 feeder roads will be constructed, at a cost of $2,000,000,000. By then, if you visit Los Angeles, you will be able to whiz over a superhighway system 613 miles long, through 60 towns spread over an area as big as Rhode Island. State and city governments are working together on this monumental project, and gas taxes are paying the bill.

Congestion Is Dropping Off

Even during peak hours, traffic moves along the freeways at speeds between 40 and 45 miles an hour. On parallel city streets it crawls at 10 to 22 miles an hour. But congestion on those streets is fading fast. Traffic volume has dropped 50 percent on Temple Street, formerly a main east-west artery. It is down 40 percent on Sunset Boulevard, 22 percent on Olympic Boulevard, 16 percent on Wilshire Boulevard.

Another dramatic benefit that the freeways have brought to Los Angeles is greater safety for motorists. Last year only one person was killed on the new speedways for every eight who died in accidents on city streets where the traffic was comparably heavy.

Nearly $200,000,000 has been spent or earmarked for the road construction that is altering the face and stepping up the pace of the city. A lot of that money was spent before a foot of roadway could be built. It went for such items as moving 3,513 buildings, demolishing 262. Property owners along the Hollywood Freeway alone were paid $27,000,000 for their homes and other buildings. Construction costs on the same eight-mile stretch added $28,000,000 to the bill.

Razed the Area

Probably the most expensive half-mile of road in the world was the short section of the Hollywood Freeway that runs through the city's Civic Center. It cost $5,500,000, double the average cost for such a distance.

At this point, crews of workmen cut down Fort Moore Hill, destroying a pair of railway and vehicular tunnels in the process. They wrecked a school building. They tore down dozens of apartment houses and stores. They relocated miles of gas pipes, underground telephone lines and water pipes. Over a 15-acre area they then proceeded to spread the octopus-like structure that weaves four speedways together at that spot.

Dump Trucks Build Mountain

Road builders cut down hills and fill ravines, hoping that the two will cancel out each other. It didn't work that way along the Hollywood Freeway and the downtown section of the road network. There were more hills than valleys.

Dump trucks began to haul dirt away from the freeway routes six years ago. They've been at it day and night ever since. At first, they simply dumped the stuff down a canyon on Bishop Road, barely a mile from the Civic Center. The canyon filled up. A small mountain took its place. It is more than 100 feet high now, 400 feet wide, 1,500 feet long. More than 500,000 loads of dirt have been dumped on that mammoth pile. Grass and eucalyptus trees have taken root and thrive on the slopes. How big the mountain will become before Los Angeles has finally licked its traffic problems, no one knows.

MORE THAN 320,000 CARS a day will eventually use the knotty-looking interchange of highways of which this is a model (above). The structure covers 15 acres and cost $5,500,000.

FOUR LEVELS OF TRAFFIC are provided for in the interchange (below). Top and third decks are for four freeways. Second and bottom ones are for local traffic and access to the freeways.

Newest Sabre Is One-Man Rocket Ship

On daily attack runs on B-17 drones, the nation's first one-man, all-rocket, all-weather interceptor is proving it can find and knock down high-flying bombers. It's the D series North American Sabre shown firing a salvo at left.

A pilot flying the D handles two jobs with an assist from electronic gear. Guided by ground control toward an intruding bomber, and flown by automatic pilot into the target area, the pilot is free to serve as radar operator and observer. Once within lethal range, little black boxes steer the interceptor and fire the 24 rockets.

The rockets fly outward in pairs at thousandth-second intervals. Where the new Sabre houses them has not been disclosed.

Cameras in both the interceptor and the drones record the flight of the rockets.

Army's New Baby—Weight 4½ Tons—Can Swim or Crawl

Here's the Army's newest vehicle—the Otter. A giant amphibious cargo carrier, it is more than 16 feet long, more than seven feet wide. It weighs 9,000 pounds and can haul a payload that adds 3,000 pounds more. Powered by a 134-horsepower, air-cooled engine, it scuttles over rough terrain, mud or snow at 35 miles an hour. Its 29-inch-wide tracks bear down on the ground with a pressure of a half-pound per square inch. Faced with a stream, the Otter wades in with stern propeller churning and makes for the opposite bank at eight miles an hour. General Motors worked with Army Ordnance experts designing the carrier, and Continental Motors built the power plant.

Largest Tire Supports 8 Tons

BIG enough to hold a man standing within its inside rim (right), this tire is 10 feet high and four feet wide. For use on a new swamp buggy, it is shown above under test on an earth mover. The tubeless tire weighs 1,482 pounds and supports 17,500 pounds at 20 miles an hour. It rides on less than half the air pressure required by your car's tires because it is mounted on a low-flange, wedge-type wheel designed for the rig by R. G. LeTourneau. The wheel also makes it possible to change one of these Firestone 48 by 68s in the field with few tools.

Building Kit Has Real Bricks

JOHNNIE becomes a bricklayer when he plays with this building kit. It has real bricks that can be used over and over again: just soak a building in water and the mortar softens. The kit also contains beams, roofing, door and window frames. An English toy, Bricklayer kits are sold by J. W. Spear & Sons, 220 Fifth Ave., NYC, for $5 and $10.

Plastic Shade Cuts Glare

YOU get sunlight but no glare when windows are fitted with this new kind of plastic shade. Pressed in place over wet glass, it clings tightly even when washed but it can be peeled off for reuse elsewhere. Shades are cut to order from white translucent, colored or "blackout black" Vinylite by Transeal, Ltd., Plainfield, N. J.

Mobile Pipeline to Fight A-Fires

FLAMES sweep an A-bombed U. S. city. Water mains are blasted and broken. But fire fighters are far from helpless.

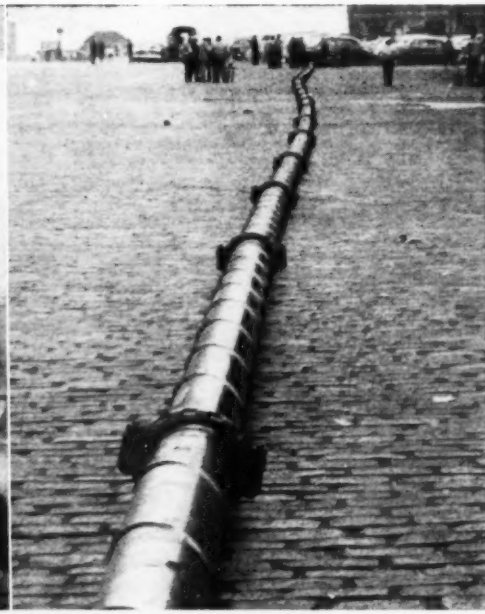
From trucks racing through passable streets, lightweight steel pipes clang to the pavement. Quick-acting couplings join them. In minutes' time, an emergency pipeline from a river, lake or reservoir brings water to firemen's hoses.

To prepare cities to carry out this plan, the Federal Civil Defense Administration is stockpiling 450 miles of special pipe this year at 36 key points.

Developed by the Victaulic Co. of America, Union, N. J., the system gets a successful New York tryout in the photos on this and the facing page.

1 CITY FIREBOAT pumps Hudson River water through hoses to emergency pipeline ashore in New York demonstration of how fire would be fought if air raid knocked out water mains.

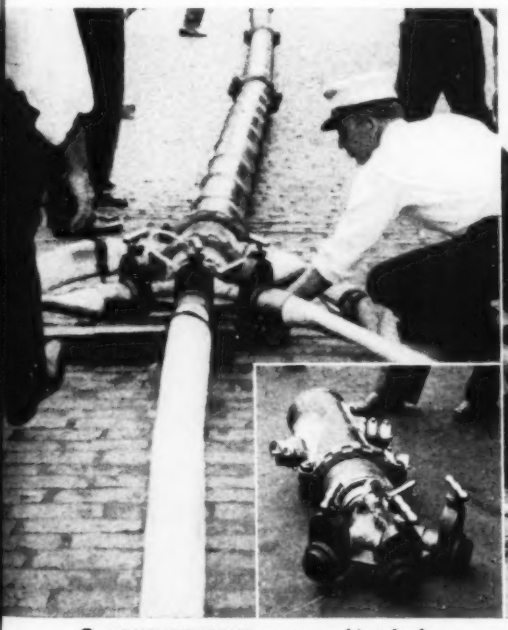
4 QUICK-ACTING COUPLING makes leakproof joint in less than half-minute. Socket wrenches speedily tighten two nuts and bolts to assemble halves of malleable-iron fitting.



5 THOUSAND-FOOT PIPELINE has been laid by cadet firemen, unfamiliar with equipment, in less than 20 minutes. It delivers 3,000 gallons of water a minute to fight a blaze.

2 TO FUNNEL STREAMS of fireboat's hoses into pipeline, this Loftus collector is readied to be fastened to intake end. Fitting is named after New York fire chief who invented it.

3 TRUCKS ROLL, laying special steel pipe in 20-foot sections. To lock grooved ends together, two-piece ring-shaped Victaulic coupling (inset) clamps over a rubber gasket.



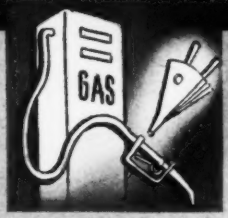
6 AT DELIVERY END, pumpers' intake hoses are connected to multiple-gate hose take-off (inset). Escaping air makes screaming whistles of fire-hose nozzles as water starts coming.

7 FIRE HOSES IN ACTION, fed by pipeline, hurl forceful 80-pound-pressure streams at imaginary flames. Walkie-talkie sets coordinate crews' teamwork all along the way. END

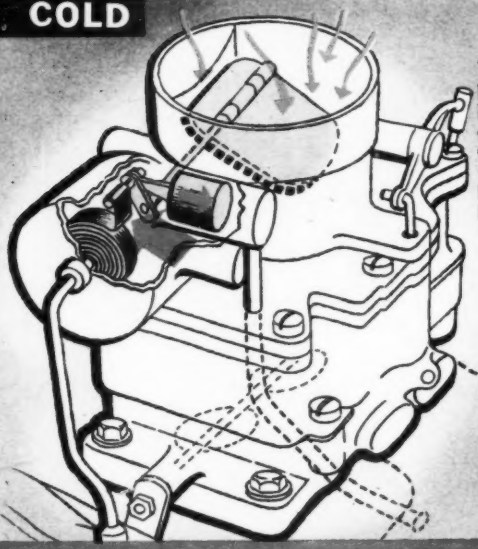
How Automatic Choke Works

THERE are several types of automatic chokes, but they all have one thing in common: a bimetal thermostat spring to control the choke valve. In some models, the thermostat is heated by an electric coil. In most, it is heated by manifold heat, as shown below. Particular mechanism illustrated here is the one Buick uses.

COLD



It takes a lot of fuel, little air, to start a cold engine.

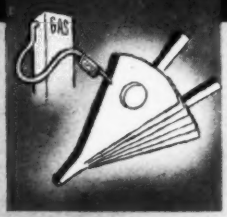


1. Choke valve is closed, blocking air passage to carburetor, when engine is cold. This creates suction on fuel jets when engine is cranked. Enough air sneaks past unbalanced valve to provide starting mixture.

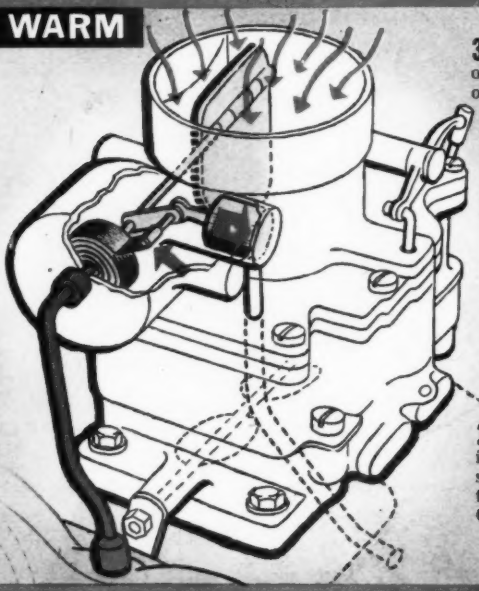
2. Thermostat spring, attached to same shaft as choke piston and choke valve, remains tightly coiled while engine is cold. It resists suction on choke piston, which tries to open choke valve as car starts.

3. As soon as engine is running, intake manifold suction, exerted through vacuum channel to base of choke cylinder, begins to pull on choke piston.

WARM



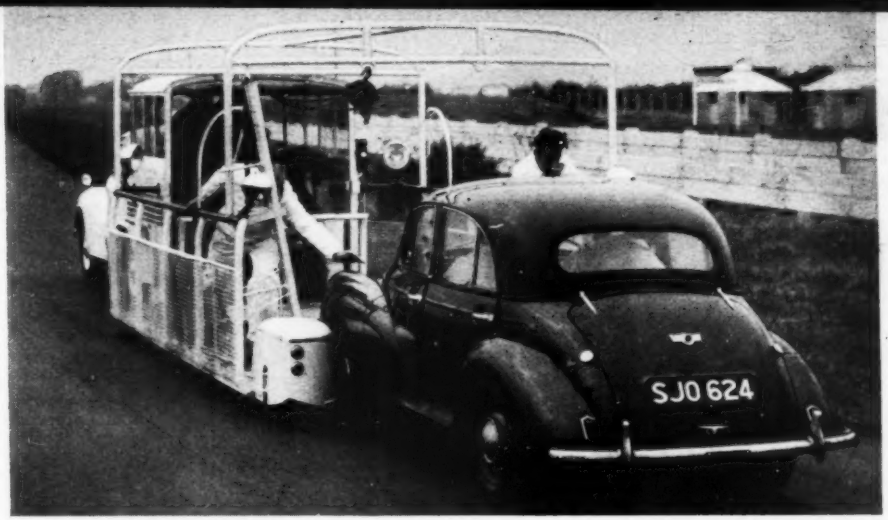
A warm engine demands lots of air and less fuel.



3. Choke valve is now opened wide by movement of choke piston.

1. As engine speed increases, hot air, heated by exhaust manifold, is drawn up tubing and through coils of thermostat spring by suction exerted on loosely mounted piston at other end of choke housing. This causes spring to expand, releasing choke piston.

2. Intake manifold suction, increasing with engine speed, pulls choke piston to end of cylinder. This turns shaft of choke valve.



TIME FOR A CHANGE of oil, tire or crew finds the little Series II Morris Minor nosing into the rear recess of the special maintenance tender that serviced it while it kept on going.

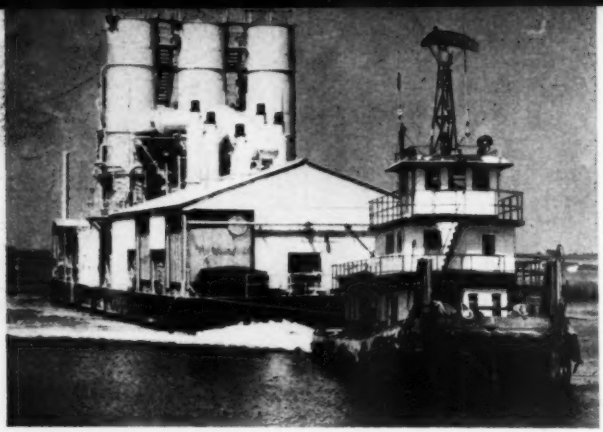
British Car Goes 10,000 Miles Without a Stop

IT DIDN'T start out as a stunt, but as a routine bit of engineering research. The Nuffield Motor Co. of England wanted to find out what would happen to the tire and gas consumption of a Morris Minor if it were driven for 10,000 miles without stopping around a circular track, as opposed to being driven the same distance over straight roads.

But to keep the car in motion, the engineers had to build a maintenance tender with a sort of bay in the back, flanked by catwalks for mechanics. Into this bay the Morris Minor slid periodically for refueling, changes of oil and even changes of tires.

Tests showed that the car used enough extra power in 10,000 curving miles to go up Mt. Everest 12 times, and six times as much tire rubber as in 10,000 straight miles.

CHANGING A REAR TIRE (above), a neat trick to do without stopping, was accomplished by hoisting the wheel affected and braking it while the other rear wheel kept on driving. At left: a grease job is done "on the wing."



Sulfur Plant Floated to Mine

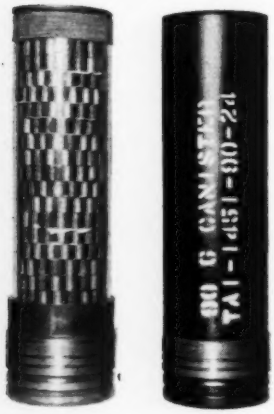
DEEP below Louisiana marshland lie valuable sulfur deposits, mined by pumping superheated water into them. The water melts the sulfur, which rises to the surface up the bore holes. It's too costly to erect a permanent mining plant there, so Freeport Sulphur Co. floated one (left) 65 miles down Mississippi to the site.

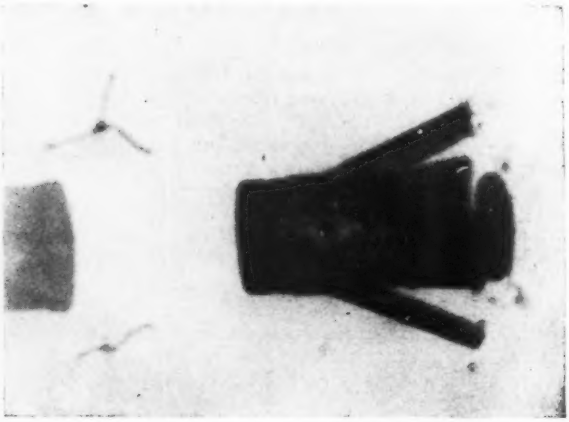
Grapeshot Brought Up-to-Date for Korean Use

BACK in the Mexican and Civil War days, a whiff of grapeshot was the old reliable way to repulse an enemy charge. It was like making a shotgun out of a cannon and using nuts, bolts and metal scrap for buckshot.

The idea, utilized in a crude form even as far back as Bunker Hill, has been modernized for use in Korea against mass attacks, when high-explosive shells would overshoot and machine-gun fire would endanger our own troops.

Can projectiles containing more than 1,000 steel pellets of uniform size (at left below) are today's grapeshot. When they explode (at right below), the pellets fly out in the shape of a fan.





They Say Now.....

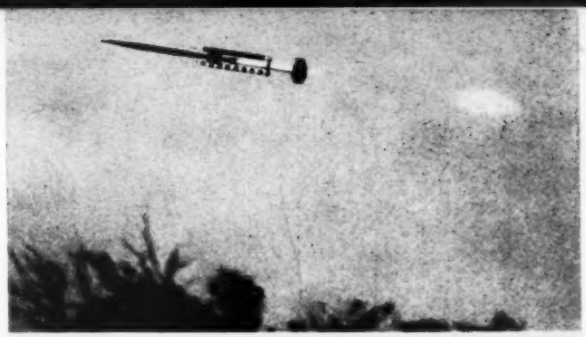
"How many people, when electricity was discovered, could visualize a modern television set? . . . Atomic energy gives every indication of bearing the same rich fruit."—Gordon Dean, chairman, Atomic Energy Commission.

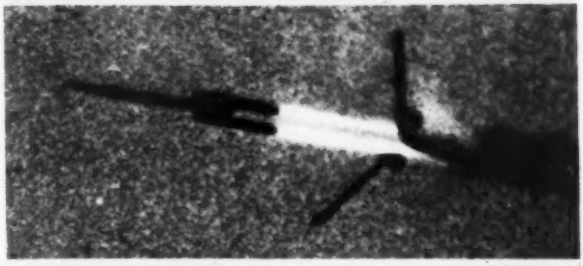
"The men who will be tomorrow's managers are the men who can see beyond today's job."—Sidney A. Swensrud, president, Gulf Oil Corp.

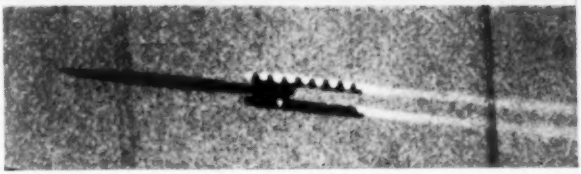
Ramjet Now Used As AA Missile

A NEW wrinkle in antiaircraft weapons is being tried out by the British. It's a ramjet assisted at take-off by rockets. When the jet-driven, wingless missile reaches supersonic speed, two rocket boosters, attached at its back, slide away and the missile proceeds under its own power.

In the top picture of the sequence at the right, the missile is shown with rockets attached, just after being launched from a twin-railed ramp. The second photo shows the 7.5-inch rockets dropping away. In the final photo the missile, which is being developed by the Bristol Aeroplane Co., is in free flight, propelled by twin nozzles from its single ramjet engine.







Kids' Hoop Rolls Down Ramp

THE toy hoop above always gets off to a straight start, for it rolls down a ramp on the handle of the metal guide rod. Called Roll-A-Hoop, it is made by Heaton-Hanset, 3607 N.E. 15th Ave., Portland, Ore.

Propeller Puts Zip in Bike

PUSHED by a tiny airplane propeller driven by a 98-cc., two-stroke engine, the tricycle above carries its builder, Malcolm Reece, along the streets of Southampton, England, at a brisk 30 miles an hour.

Experts Pick 1952's

Medicine leads atomic research two to one as 10 crack science reporters choose the hottest stories of the year. Here are selections of men who cover the labs.

By Hartley E. Howe
CARICATURES BY SAM BERMAN

ARE new victories in the war against disease the biggest science news of the year? Or will 1952 be best remembered for long strides taken in man's exploration of the atom, with its hope for richer life—and its threat of grimmer death?

Whichever you say, you can find experts to agree with you. For medicine and atomic research have dominated the science news this year—although a majority of the top science reporters picked medical news. Headliners include:

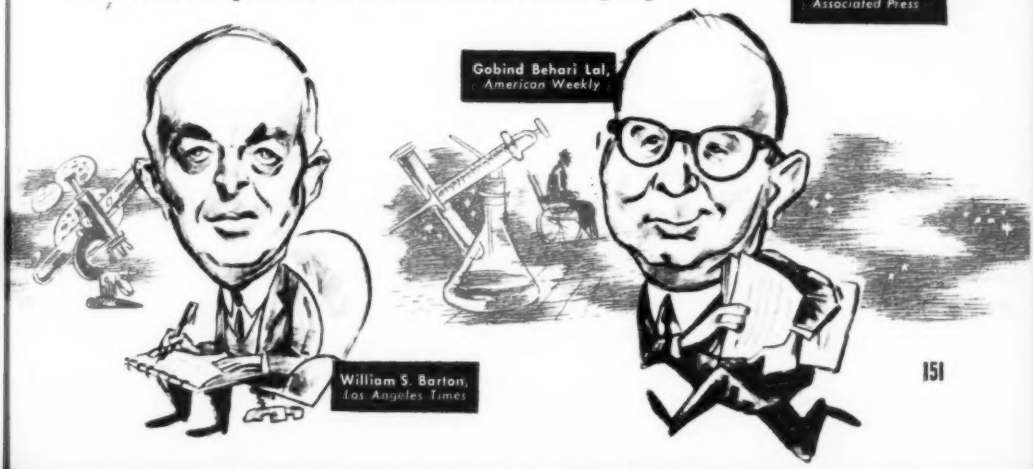
- The hydrogen bomb.
- New drugs to help prevent and relieve polio.

Biggest Science News

- The discovery of new anti-tuberculosis drugs—and their limitations.
- Electricity from atomic energy.

POPULAR SCIENCE MONTHLY asked 10 of the nation's outstanding science editors and reporters—all members of the National Association of Science Writers—to choose the biggest science stories of 1952. Six of the 10 picked events in medical research. Three chose atomic developments. Only one went outside these fields for his selection.

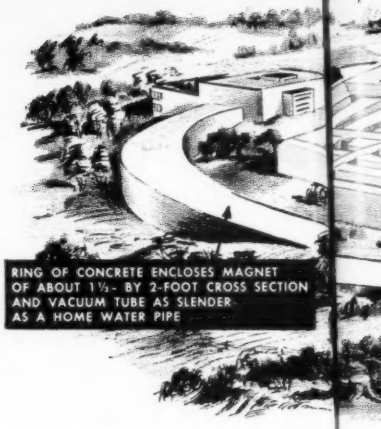
The lone eagle is **Victor Cohn,** science reporter for the *Minneapolis Tribune.* He believes the big story of the year was the exposure of a possible weak spot in our national defense. Cohn points out that Dr. Vannevar Bush, wartime science-research head, has challenged the ability of the armed forces to make use of new scientific developments, claiming that the joint chiefs of staff and their advisers are badly organized. Equally sharp criticism, Cohn notes, comes from Lloyd V. Berkner, who is a Defense Department consultant and heads the group



Will U. S. Build This Atom Gun?

The world's most powerful atom smasher, Brookhaven National Laboratory's 3,000,000,000-volt Cosmotron, began work this year. But now a way has been found to build atomic guns of 30,000,000,000 to 100,000,000,000 volts' power. Development of plans for such a giant is likely to be one of the big science stories of 1953.

Brookhaven physicists have discovered how to focus atomic particles into a narrow beam and thus accelerate them within a far slimmer vacuum tube. This will reduce thickness and cost of a ring-shaped magnet to guide them in a circle, and may lead to the atom smasher pictured—2,000 feet across and of 100,000,000,000-volt power.



RING OF CONCRETE ENCLOSES MAGNET OF ABOUT 1½- BY 2-FOOT CROSS SECTION AND VACUUM TUBE AS SLENDER AS A HOME WATER PIPE

that runs the Brookhaven atom center.

Berkner believes that Russia will have a dangerously big A-bomb pile within five or 10 years, and says:

"Early in 1951, scientists close to military problems began to realize that a series of technological 'break throughs' had occurred that might make a sound defense reasonable and effective." This job is urgent and direct communication between top scientists and top U. S. planners is now so poor that a new civilian-scientist weapons agency needs to be organized, Berkner argues.

And Cohn sums it up: "Seldom has an American scientist made a policy statement so challenging."

Waldemar Kaempffert, science editor of *The New York Times,* picked the new antituberculosis drugs as the biggest '52 story. Called hydrazides, the drugs were first used with remarkable results at New York City's Sea View Hospital.

New Anti-TB Drugs Better, Cheaper

Kaempffert says, "After nine months of clinical experience, it turns out that the hydrazides are no perfect solution of the problem presented by tuberculosis. The TB bacillus quickly adapts itself to most antibiotics and chemical therapeutic agents, the hydrazides included.

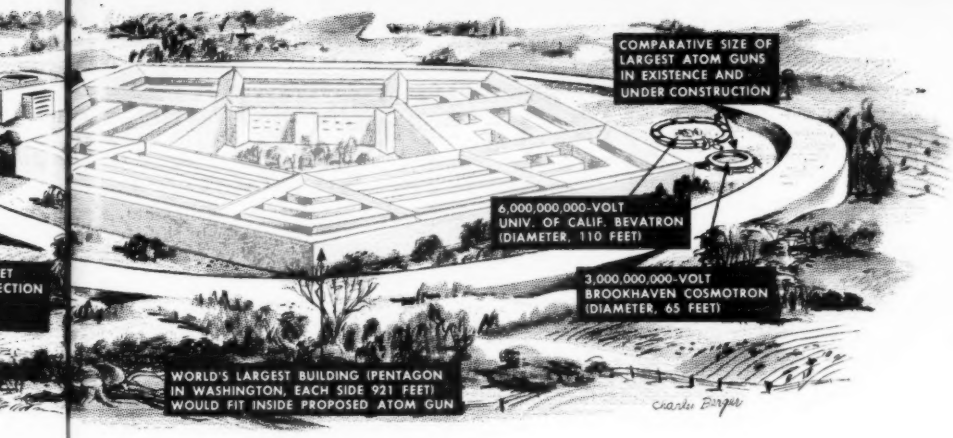
"Yet even cautious medical men admit that with the hydrazides it is possible to treat tuberculosis with an efficacy not hitherto achieved by other drugs. And a hundred dollars' worth of hydrazide will do as much, and sometimes even more, than three thousand dollars' worth of other drugs."

The same story, but with the emphasis on the speed with which the drugs' limitations were found, was the choice of **Nate Haseltine,** science editor of *The Washington Post.* He points out that "intensive research with the hydrazides, in the face of public clamor for them, proved in the incredible lapse of but three months that the drugs are truly a boon to humanity but not the quick home cure that many had believed . . ."

Polio Fought Two Ways

Three experts chose research in infantile paralysis. **William S. Barton,** science editor of the *Los Angeles Times,* voted for a chemical treatment that rebuilds polio-withered muscles. He reports surprisingly promising results in a limited series of tests when two inexpensive drugs, betaine and glycocyamine, are given patients left crippled by the disease. Where the muscles retain some residual activity, their power increases. In some cases the muscles actually grow 40 percent. A boy with a withered arm can do push ups.

Dr. M. E. Borsook of Los Angeles, aided by two other doctors, developed the new drugs. The doctors believe that the drugs increase the supply of creatine, a tonic normally found in muscles. This enables what muscle is left to take on a



good part of the load of those destroyed by polio.

Gobind Behari Lal, science editor of *The American Weekly* and the Hearst papers, also picked a polio story. But Lal's deals with prevention—a vaccine made from the living disease virus. This year saw patients who had been given the vaccine complete two years without harmful results. Lal writes:

"Dr. Hilary Koprowski and his colleagues of the Lederle Laboratories had developed a TN virus, a weakened polio virus, which they boldly fed to children. In their blood were formed antibodies, chemicals capable of fighting the disease-causing virus of a given type. At the same time, Dr. Harold R. Cox of Lederle found how to grow the weakened virus in chicken eggs. Although used so far only on monkeys, the egg-grown virus could mean a mass-produced vaccine.

"Here is the possible lead to a practical method of 'vaccinating' against polio—and may loom up as the most important science story of 1952."

Arthur J. Snider of the *Chicago Daily News* picked yet another polio story. "Disclosure that injections of gamma globulin containing antibodies against three known polio viruses gave 'significant protection' against paralytic polio gives us for the first time a material shown to be effective in blocking to a large degree the paralysis of polio.

"While this is not the final answer to polio—the duration of immunity is too short—gamma globulin may dampen the severity of the disease."

Alton L. Blakeslee of the Associated Press chooses the development of a mechanical heart that works in humans as 1952's big story. Three Detroit doctors—F. D. Dodrill, Edward Hill and R. A. Gerisch—revealed that the power-driven "heart" had been used to help pump blood through a patient for 50 minutes while his heart was opened to fix a valve.

The mechanical heart works like a six-cylinder auto engine—General Motors engineers helped develop it. Blakeslee points out that it means the first step toward a time when it will be possible to bypass a person's heart while surgeons make repairs.

Atomic Power Created

Now let's give the atom boys their innings. **Severino P. Severino,** science editor of the *Cleveland News*, picked the new 3,000,000,000-electron-volt Cosmotron at Brookhaven (PSM, April '52, p. 110) as the big science news of the year.

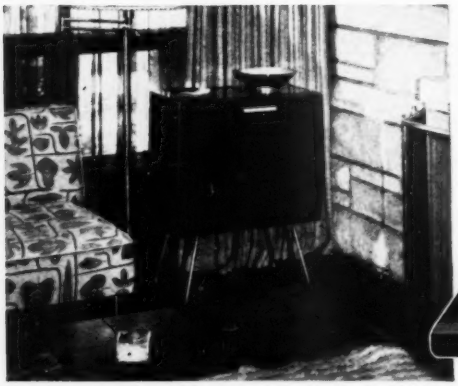
"This promises to open new fields in this age of atom smashing," Severino declares. "A new 'big muscle' that can produce the highest energy ever achieved, it brings us closer to learning the secrets of the atom than ever before."

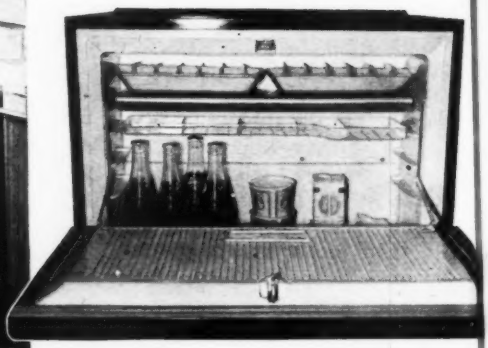
But a really smash-headline atom story is the H-bomb, chosen by **Pierre C.**

[Continued on page 246]

New Furniture Does Two Jobs

1. Hassock Becomes Tables. This come-apart footrest makes three benches when you're short on chairs or three snack tables when food is passed. Lined up in a row, Stak-O-Seats makes a coffee table. The folding legs are hardwood, tops are plastic.



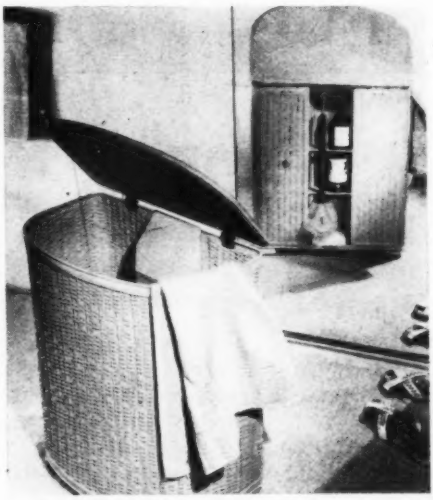


2. Cabinet Masks Refrigerator. A plastic cabinet (colored mahogany, blond or white) takes this refrigerator into any room in the house. It has two cubic feet of storage space and contains two ice trays. The open door forms a sturdy work counter. Shut the door and the Wonderbar's function as a snack server is completely disguised.

3. Radio Beds Down with Lamp. A radio is combined with a fluorescent lamp to let you read in bed while listening to your favorite musical program.

A frosted-glass lens over the lamp cuts out glare. The unit operates on AC or DC. Adjustable brackets fit the set to any headboard, and wall brackets are provided for mounting it over a Hollywood bed. The Lullaby combination is 12 inches wide.

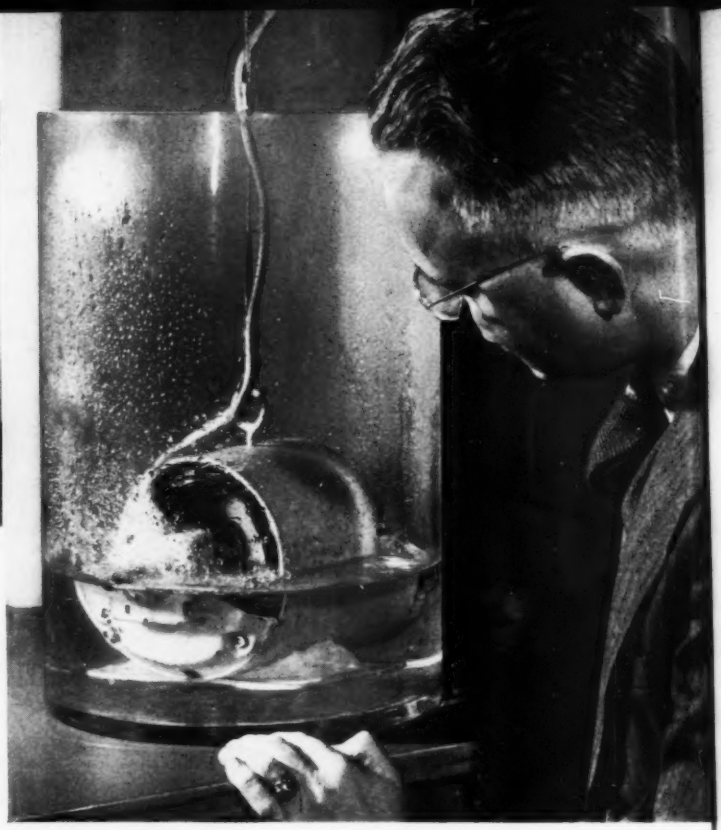
4. Table Folds into Wall Shelf. Pull down the shadow box (left above) and the wall plaque on which it is mounted comes with it to form the table top 30 by 48 inches you see at right above. The Decor-Table is useful in a kitchen where traffic would be stopped by a regulation table since it folds out of the way when not in use.



6. Hamper Hides Storage Shelves. Even the hamper does double duty. When this one turns its back, it hides a secret compartment for cleaning brushes, cleansers and bathroom supplies. Made of woven fiber and steel, it's called the Hold-A-Brush hamper.

5. Rack Hangs Silver. This slant-front hanging chest, lined with cloth that retards tarnish, holds 150 pieces. It comes in pine or mahogany finish.

Further information on these products can be obtained from: 1. Greenhall, 509 Fifth Ave., NYC; 2. Servel, Inc., Evansville, Ind.; 3. Mitchell Mfg. Co., N. Clybourn & Terra Cotta Sts., Chicago; 4. Kebby Co., 2320 Custer Ave., Rockford, Ill.; 5. Yield House, Box 179, North Conway, N.H.; 6. Pearl-Wick Corp., Long Island City, N.Y.



BOUNCING PUTTY, a silicone preparation, is nonresilient until formed into a sphere. Then it comes to life and rebounds like rubber ball (above). Its cousin, silicone rubber, insulates motor at right. Half under water, motor can run so hot that water boils.

Look What's Happened

Once an oddity, it now makes heatproof rubber, iceproof airplanes, waterproof clothing, leakproof cellars—and stickproof waffles.

By Richard Match

ONE June afternoon in 1951, 37 F-84 Thunderjets rose from the Wright-Patterson Air Force Base at Dayton, Ohio, and streaked westward. Ten minutes after take-off, eight of the planes plummeted to earth in flaming wreckage. It was jet aviation's biggest disaster.

FBI and Air Force men combed the wreckage for evidence of sabotage. Four days later, they publicly identified the "saboteur"—ice had blocked the jet air intakes, and the strangled engines had exploded.

Air Force designers promptly sought help from the research chemists. Was there a rubber-like material that could be electrically heated to keep ice from sealing shut the air-intake doors? At temperatures hot enough to melt ice, natural rubber and even synthetics melt into a sticky mess or harden and crack. The chemists had an answer. It was a member of that extraordinary new branch of the glass family called silicones.

To laymen, silicones are most familiar in the form of "bouncing putty," an oddity developed during World War II.

This curious substance looks like bubble gum, molds like modeling clay and bounces higher than a tennis ball. Actually it is a chemical cousin of ordinary window glass—made, like all silicones, from coal, oil or gas and the silicon found in sand.

Appropriate molecular changes produce silicone rubber, a material which shrugs off temperatures 250° higher than could the most heat-resistant rubber previously known. American jet engines now have deicing flaps made of it.

Rubber Resists Arctic Cold

Silicone rubber proved as impervious to arctic chill as it is to tropic heat, retaining its stretch over a temperature range of 600°. Your new kitchen range, incidentally, may have the same kind of superhardy rubber strip around its oven door, to insure better-controlled baking temperatures.

Rubber, however, is only one member of the resourceful silicone family. There are paints that do not blister on factory smokestacks furnace-heated 500° to 1,000°.

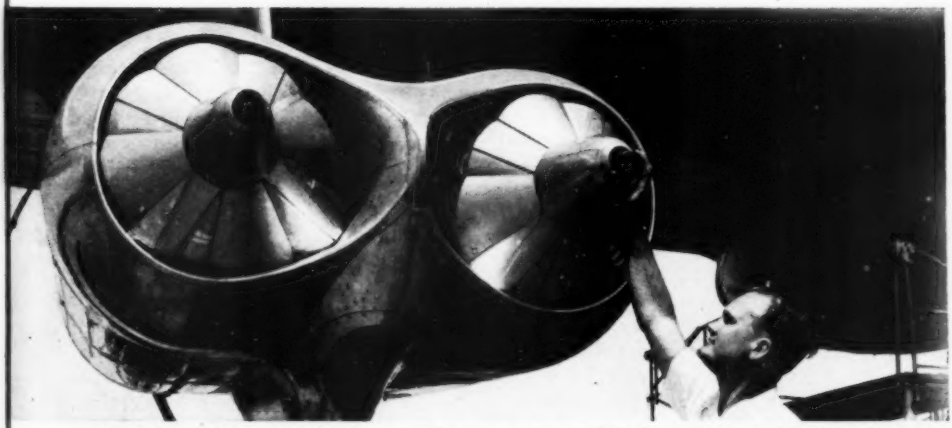
I have seen silicone water repellents that promise to solve forever the homeowner's ancient problem of leaky masonry. Ordinary cotton cloth, silicone-treated, sheds water as easily as a rubberized shower curtain. Silicone fluids, which pour at minus 120°, are used to fill the sextant bubble levels of aircraft operating across the North Pole. Silicone insulation, indifferent to the heat normally generated by electricity in action, enables electric motors to work twice as hard as they did before, at the same time prolonging their working life many times over.

The first organo-silicon compound was created in Germany in 1863. Later, an Englishman, Dr. Frederic S. Kipping, spent more than 40 years accumulating the technical knowledge on which modern silicone chemistry is built.

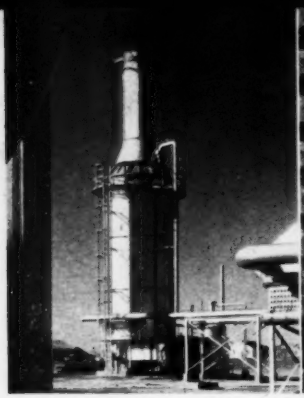
It was American chemists who put Dr. Kipping's pure science to work. In 1932 the Corning Glass Works—reportedly seeking a flexible window glass—hired Dr. J. F. Hyde to investigate the chemical realm between glass and plastics.

By substituting a silicon-oxygen frame-

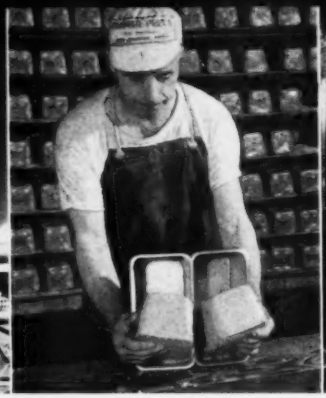
to "Bouncing Putty"



DEICING PADS for air-intake doors of jet engines, made of heat-resisting Silastic (silicone rubber) reinforced with glass cloth, can be heated by resistance elements to 450°.



SILICONE PAINT on this oil-heater stack will have life of 18 months or more, despite surface temperature of 400° to 600°. Other paints had lasted only a few days.



BREAD WON'T STICK to pans coated with Dow's Pan Glaze. A resinous silicone originally developed for dough baking, it is now used on meat-loaf pans and frozen-food trays.

CAST-ALUMINUM PARTS are released most easily from mold with aid of a silicone emulsion. Before casting, silicone is sprayed into hole through which molten metal flows.

work for the carbon-to-carbon structure common to such familiar materials as rubber, textile fibers and plastics, Dr. Hyde succeeded in making the world's first useful silicone. Shortly before, Owens-Corning had developed Fiberglas, which promised to be a superb insulating material if some equally heat-resistant resin could be found to hold the glass fibers together. Hyde discovered that a silicone resin would do the job, and a new industry was born. Dow-Corning is the silicone-producing offshoot of that discovery.

That same year, General Electric's chemical division independently launched its own silicone research. A few months after Pearl Harbor, GE's Maynard C. Agens made the first laboratory samples of silicone rubber. Union Carbide's Linde Division and Libby-Owens-Ford are the other major silicone producers.

Insulation Withstands 5,000° Fire

Silicone-Fiberglas insulation is today one of the sinews of American industry. It possesses fabulous resistance to the two great foes of electrical insulation: heat and moisture. At the McGraw Electric Co.'s Pennsylvania Transformer plant, a 5,000° flame was applied for equal intervals to a sheet of silicone-Fiberglas and to a steel plate two inches thick. The steel was cut through, the silicone surface only singed.

In overload tests, motors with conventional insulation always shorted and caught fire when they failed. The silicone-protected motors never did. Silicone insulation, already widely employed in Diesel-electric traction motors, is gaining use in motors exposed to tough operating conditions in the textile and chemical industries and in protecting electronic equipment from moisture and heat.

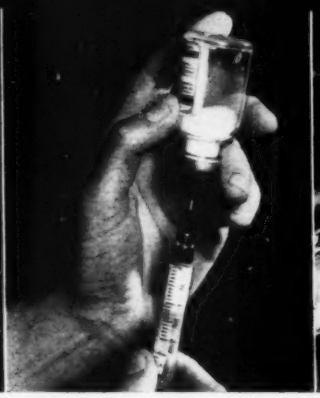
Silicones Guard Ships

By Navy order, silicone insulation, both resin and rubber, now guards the most vital electrical cables on all new U. S. fighting ships. Silicone rubber is of particular importance to the Navy, for when it is exposed to flame, it simmers to a firm white ash. This ash is itself an adequate temporary insulator and keeps control cables working and big guns firing even after severe flame damage.

Eventually silicone tires may be a possibility. The drawback is that the silicone product has less tear strength and abrasion resistance than present tire rubber. The chemists, however, have been adding muscle to silicone rubber ever since World War II and admit that they have made notable progress.

Another pleasant possibility for the car of the future is silicone lubrication. Silicone oils do not oxidize into gummy carbon sludge and consequently have

EGG FRIES on heat-resisting silicone rubber that has resistance elements embedded in it. Rubber is used in electric blankets and soil heaters as well as plane deicers.



PENICILLIN VIALS get an inner silicone coating that keeps a suspension of the expensive drug from clinging to its container, permitting the last drop of it to be used.

LEAKY MASONRY, an all-too-familiar problem of home-owners, is sealed by a new silicone water repellent. Window sill treated with it sheds water completely (above).

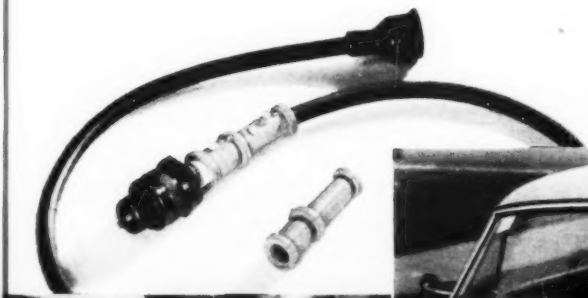
a working life anywhere from 10 to 40 times that of petroleum.

Silicones are not yet satisfactory crankcase lubricants, but they already have important industrial uses. Huge Detroit conveyor lines that used to keep a man busy full-time with an oilcan are now oiled once a week; machines that used to run six months between oilings now run three, four and five years.

In paint, the silicones' effectiveness lies in something they *don't* do—in their family trait of inertness, as chemists call it. Ordinary outdoor paints crack, peel and yellow chiefly because their resinous binders break down—oxidize—on exposure to the elements. Inert silicone resins stubbornly resist oxidation.

But the new paints are still too costly except for those jobs where the silicones' hidden strength makes them cheap

[*Continued on page 248*]



CAR OWNERS use silicones in quick wipe-on, wipe-off polishes (below), moisture-excluding "boots" of silicone rubber for spark plugs (upper left), and a compound that reduces corrosion when applied to battery terminals (lower left).

Frenchman Cycles English Channel

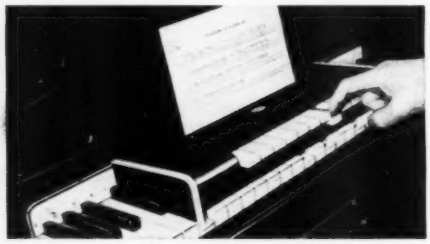
MOUNTING a motor scooter on an 18-foot raft, French motorcycle champion Georges Monneret put-putted his way across the English Channel. The scooter's rear wheel drove a propeller while the front wheel controlled a rudder. Once on land, Monneret shed the raft and drove happily off to London.

Let It Snow! This Golfer Can Practice Putts in the Living Room

THE contented golfer at right is perfecting putts on a green eight feet by two. It stows away in a tube. Yund Bros., 39 New Scotland Ave., Albany, N.Y., make it.

Pianist Can't Hit Sour Note

ONE-FINGER pianists now have an aid in an 11-note keyboard (below) that fits over a regular one and plays a pleasant three-note chord for each key struck. Playano Sales Corp., 10 E. 39th St. NYC 16, sells it.



Special Chrysler with a New Sports-Car Look Is Shown in Paris

ALONG with its entire 1953 line of passenger cars for export, Chrysler showed the special sports coupe at left in this year's Paris Automobile Show. The car was built as a design study, not for sale. Made by Ghia in Turin, Italy, as were Chrysler's other experimental sportsters, the C-200 and K-310, it has high, curved fenders, wire wheels and a low, racy look.

Four Wheels Steer Truck to Bigger Payloads

HIGHWAY trailers drawn by this new six-wheel tractor can turn corners more easily with bigger payloads. When the driver steers the front wheels, a drag link and tie rod swivel the middle wheels.

Steering knuckles are located at each of the single wheels on the independently mounted middle axle. To avoid drag, these wheels steer only a third as far as the front ones. The rear duals of the tractor are still the driving wheels. Adding a third axle allows operators to increase their legal payloads by 4,000 pounds. The White Motor Co. tractor can be used with all trailers.

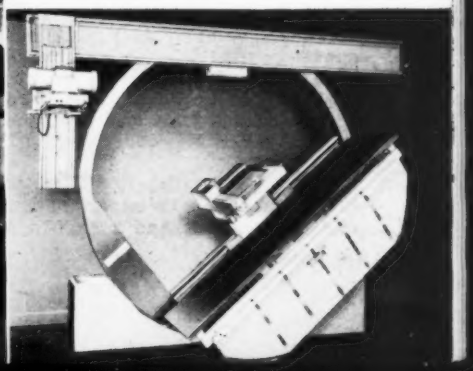
CHALK LINE dramatizes swiveling of the new White truck's second pair of steering wheels. Note that they turn only slightly although front ones are turned hard.

STEERING PUSHER, as middle axle is called, is seen at left on truck that road-tested it. Axle weighs 1,350 lb., has 10.00 by 20 tires.

New X-Ray Table Rides Around Ring Track

SOMETIMES it is necessary to stand hospital patients on their heads to make X-ray studies of their innards. This is an awkward and cumbersome process with conventional X-ray tables. Now a new type, seen from two angles below, rotates the subject through 180 degrees on a ring track.

The ring mounting also permits lighter counterweighting for the fluoroscopic screen (left below) and saves space. General Electric makes it.



P.S.

Last minute news & notes...

"TIME-BOMB" PILLS now enable a patient to take enough doses of a drug all at once to last a whole day or night. Called a Spansule, each capsule holds as many as 100 tiny tablets with neutral coatings of graduated thickness, which take varying times to dissolve in body fluids and release the medicine . . . ANTI-POLIO PILLS to immunize children are on the way. They will contain a "tamed" form of living polio virus, Lederle experimenters predict . . . SYNTHETIC CORTISONE for arthritis and other diseases is now a reality. Merck chemists report that they can prepare it from simple, readily available chemicals.

JET-PROPELLED DIRIGIBLES are on trial in Italy. The first, 184 feet long and 42½ feet in diameter, is reported to have completed a series of successful test flights.

MAGNETIC "LABELS," read by an electronic brain, route cans of fruit through a California plant. The labels are signals magnetically recorded on the bottoms of the cans just as sound is recorded on magnetic tape. In this way, sealed cans containing different grades of fruit can share many of the same processing steps, then be separated after cooking.

AN INVISIBLE BEACON that you have to peep into to tell if it's lit has been developed for the Army by the Armour Research Foundation. The gas-burning lamp emits infrared rays that can be seen only with such special viewing aids as the Army's "sniperscope." It will be used for marking assembly points and road blocks without an enemy's knowledge, and possibly for secret signaling.

HIGHEST ELECTRICAL RESISTANCE of any known material is reported for a new transparent and flexible plastic film, especially suitable for condensers. In addition to its remarkable insulating qualities, it is as strong as hard aluminum, highly resistant to impact and unaffected by heat up to about 400°. Called polyethylene terephthalate, it is chemically related to the synthetic fiber Dacron.

HIGH-SPEED JET SEAPLANES of secret and radically new design are to be built for the Navy by the Glenn L. Martin Co. . . THE F-102, the country's first supersonic delta (triangular) wing fighter plane, is now in production for the Air Force.

$75-A-GALLON PAINT is finding a brisk market. A unique property of the Teflon finish makes it worth its high cost--practically nothing will stick to it. Manufacturers are testing it for coating bread-baking pans that will need no greasing and machine parts that glue cannot gum up, says the maker, du Pont.

FIRST GUIDED-MISSILE WARSHIP has been launched by the U. S. Type and size are hush-hush. Only hint: vessel is designed primarily for antiaircraft defense. It was known that the Navy was converting the 13,600-ton heavy cruisers Canberra and Boston into missile ships. Earlier, work had been suspended on the unfinished battleship Kentucky and battle cruiser Hawaii, pending perfection of plans to arm them with guided missiles.

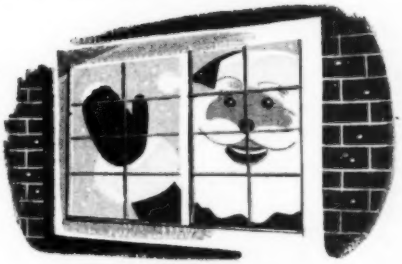
THAT LITTLE CAR that Nash showed off two years ago, as what a $1,000 automobile might look like, is going into production. Powered by the Austin A-40 engine, a light sports model will be built in England for sale in the U.S. by Nash dealers. Deliveries are scheduled for late next year; price, not yet announced.

"DEODORIZING MATCHES," resembling ordinary matches but with heavily coated and elongated heads, are said to banish odors in a room and fill it with a pleasant fragrance. The minature incense sticks are lit by striking them on the side of their box, which holds 40. They are held in the hand while they burn.

The Editors

Make Your Home a Christmas Card

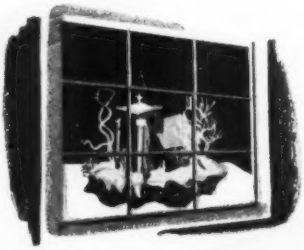
Large-size decorations to liven up your windows take little time to make and will extend hearty holiday greetings to all who pass by.



Big smiling Santa is a whole set of separate colored cutouts—one for each windowpane—that can be easily taped to inside of glass.

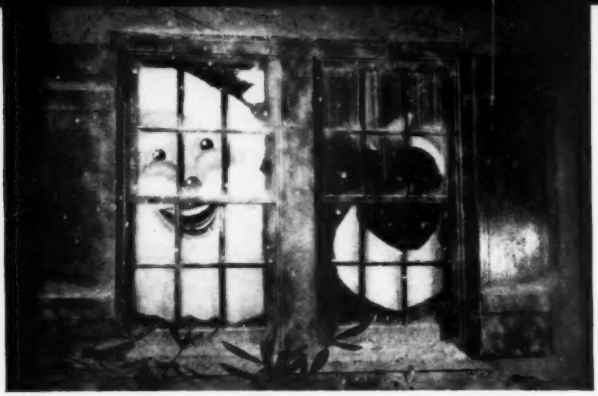
This trainload of Christmas greetings set up on the front lawn is really going places—on wheels turned by an old phonograph motor.

Old-fashioned horse-and-buggy street scene is a simple cardboard silhouette with a tiny bulb in back to light the travelers' way on a wintry night.



Rags soaked in quick-drying plaster of Paris form a frosty hillside setting for a brightly illuminated Gothic church.

Super Santa Made in Sections Is Easy to Put Up and Take Down



HERE's a natural for a pair of abutting, multipane windows. Santa peers out with a welcome as large as his eight-times-life-size head and waving mitten. Looking at him from the street you'd never guess that he is a many-sided personality, with each segment taped to a single pane of glass.

With the exception of a button nose and the whites of his eyes, Santa's face is painted in tempera colors directly on the surface of cardboard. The eye sections are removed, like those of a jack-o'-lantern, with a mat knife and backed up with tracing paper to let the light from the room behind them filter through. All of the white areas—whiskers, cuffs and cap trimming—are covered with cotton batting, and the red portions of the coat, mittens and cap are surfaced with colored felt. Use rubber cement to hold the material down. Unlike glue it will not leave a stain if it soaks through.

One of the advantages of this design is the ease with which its small parts may be stored away for use another Christmas.

DRAW SANTA on single sheet of cardboard (or several sheets butted together), then cut, removing strips the width of window moldings.

Lights Blink and Wheels Turn on Animated Train

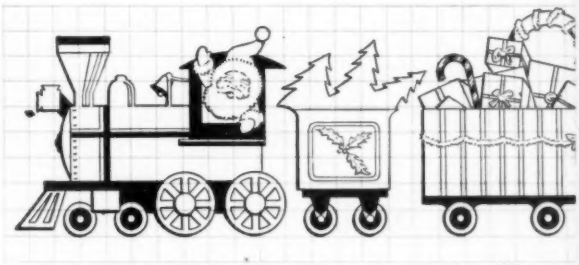
HIGHWAY traffic comes to a full stop when Santa makes his appearance in Morton, Ill., each year, riding high in the cab of a diamond-stack locomotive trailing a gondola-load of candy canes, wreaths and packages.

Robert Hawkins had an eye for the weather when he designed this jumbo outdoor card, which measures 67″ by 118″. Its husky, two-section framework, covered with heavy cardboard, is securely anchored to 2″ by 2″ by 16″ stakes driven into the ground, with further bracing supplied by heavy guy wires. Cardboard cutouts of the locomotive and cars are held away from the background by 3″ spacer blocks to produce a bold relief effect. This also provides space for an electric socket, blinker unit and bulb behind the "oil" headlight.

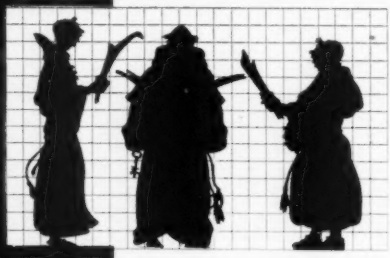
But the real gimmick is the motion of the driving wheels, which are turned by an old phonograph motor, directly coupled to the forward wheel, with a belt connection turning the rear wheel.

To make a logical smoke pattern of the lettering, the train has to run from right to left, and this calls for the phono motor to be reversed. Because all of these units are of the shaded-pole variety that is a simple operation, involving nothing but the removal of the bearings and a reversal of the motor pole piece. Remember that a wet snowfall can play havoc with moving parts and electrical connections. To avoid a "road breakdown," protect the motor with a boxlike housing.

Floodlights, concealed in nearby foliage, bring out the bright coloring of the red and green train, the metallic stars set against a neutral gray sky area, and the shimmer of mica sprinkled on the white "snow" behind the whirling wheels.



Please turn the page for more Christmas ideas.

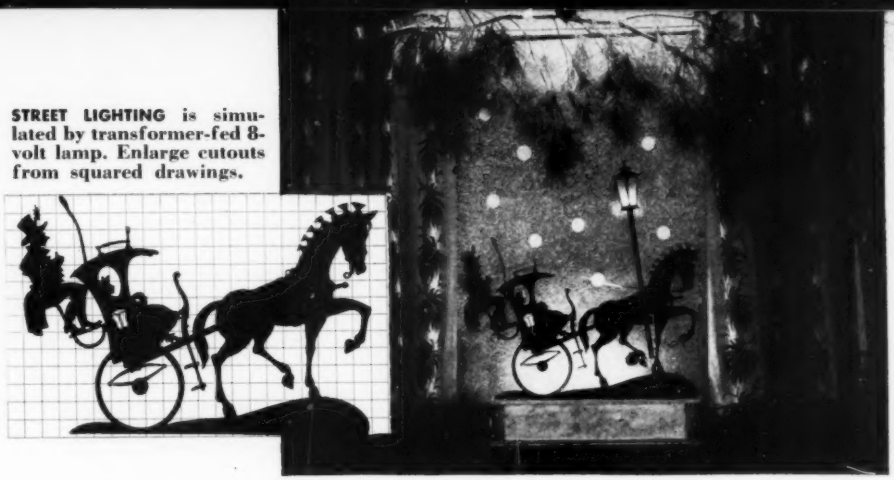


SILHOUETTES are back-lighted by two 30-watt bulbs in base and one 75-watt bulb behind pipe organ.

Back-Lighted Silhouettes Shine Window Welcomes

SILHOUETTES make simple and effective window Christmas cards when backed with dramatic lighting. In laying out a design, bear in mind that large masses of black are uninteresting unless relieved by a certain amount of open work and angular detail. The two designs pictured here are good examples of well balanced silhouettes, and can be scaled up without too much trouble.

You may want to make your cutout of cardboard, but unless it is reinforced with light molding it will have a tendency to curl. If you have a jigsaw and a piece of



STREET LIGHTING is simulated by transformer-fed 8-volt lamp. Enlarge cutouts from squared drawings.

composition board you can turn out a more durable job—one which can be stored away for another Christmas.

In either case, the silhouettes should be painted a flat black—showcard color for the cardboard, oil paints for the composition board. A window free from a confusing crisscross of molding makes the best frame for the cutout.

For the background, use metallic paper illuminated by a bulb hidden in a small box at the base of the silhouette, or placed directly behind the cutout. Mica-surfaced roofing paper can also be used, and the shiny flakes suggest softly falling snow. Or you can work up a background set, like the pipe organ made of gilded mailing tubes shown on the adjoining page.

Table-Top Church Is a Whole Show in Miniature

BEHIND that small window overlooking the porch, or placed atop your television set, this illuminated Gothic church will shed its Christmas cheer in all directions. The building is made of cardboard, shellacked and coated with gray sand. Bits of yarn form the vines, and the leaves are fragments of green crepe paper, sprinkled over re-shellacked areas. Window cutouts are backed with tracing cloth, allowing light from a small bulb to filter through.

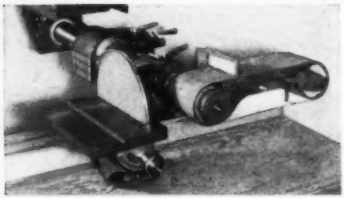
For the landscaping rough out a light framework of wood. Next make a thin mix of plaster of Paris—about the consistency of cream. Saturate a number of old rags in the wet plaster and, working quickly, mass them around and over the framework to resemble rock formations and sloping earth. Use whatever plaster remains to cover the seams where the strips of cloth overlap. When the plaster sets, the rocky knoll will be a fairly rigid unit to which you can attach sponge-rubber hedges and trees made of inverted roots trimmed to shape.

Here, again, sprinkle sand over shellacked areas to produce stone textures. Sawdust makes good grass, but don't stain it green. Instead, work in tints of yellow and brown. You say you want to cover your model with snow, not clumps of dead grass? Then look at a typical winter scene and see how blotches of warm color liven up the white stuff, especially on steep slopes.

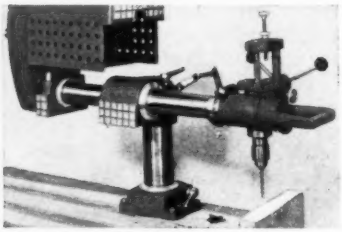
You are now ready to manufacture your own snowstorm, and you can cover as much or as little of the church and the hill as you like. After painting top surfaces white, get yourself an artist's atomizer—the kind used to spray fixative on drawings. Heat a pan of paraffin and, using the atomizer, spray the hot liquid over the model. The paraffin will turn white as it lands in tiny droplets. A light coat will resemble frost. Go on building it up and it will become wet, clinging "snow." Window areas, incidentally, should be masked during the operation to prevent them from becoming opaque. The little, black-robed figure in front of the door can be carved from a block of wood, or modeled of clay over a wire armature.

Want sound effects? There are plenty of good organ recordings. Hide a phonograph in the base—and there you are. END

3 New Multipurpose Tools



AS A BELT AND DISK SANDER, it can be used horizontally or vertically. This attachment also can be used as a thickness sander.

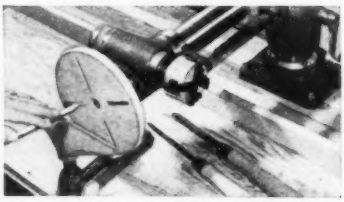


AS A DRILL PRESS, it can be used at any angle and an adjustable radius. This attachment has 3″ stroke, 18″ throat and can be used as router.

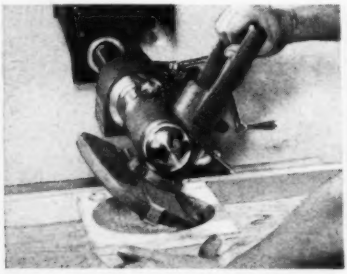
You Can Carve with This Saw

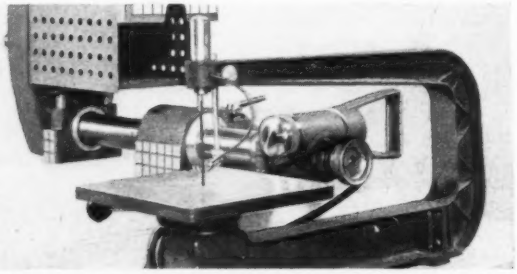
VISITORS to the New York Hardware Show this fall saw three new multipurpose tools. This one, starting out as a radial saw, can also drill, rout, sand, shape, grind, buff and do lathe turning. The saw blade can be used horizontally or vertically.

The ½-hp. motor drives through a four-step pulley and a shaft within the radial arm. Attachments can be powered from the shaft end or through a worm gear. Shopmaster is priced at $250, less motor, by Shopmaster, Inc., 1214 S. Third St., Minneapolis.



AS A LATHE, it will do faceplate turning or center turning. A tailstock, not shown, can be mounted for use with four-jaw chuck above.





AS AN 8″ CIRCULAR SAW, it will cut cup shapes as well as compound miters, cross cuts, rips and dadoes. The machine's depth of cut is 2 9/16″ (left). As a power plant, power take-off can drive other tools such as a jigsaw (right), jointer or a bandsaw.

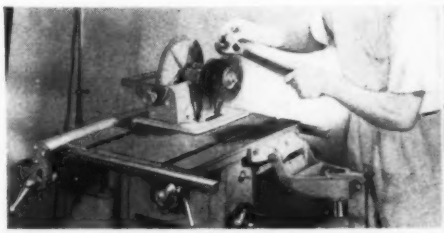
Unveiled at Hardware Show

You Can Take Apart This Combination to Make Four Tools

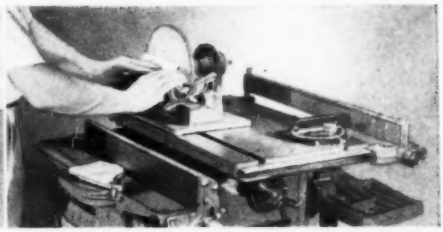
Four basic tools are wrapped up in this combination—a circular saw, jointer, sander and drill press. Yet the four tools can easily be separated and set up on their individual stands to form a four-tool shop.

Deltashop occupies a 3′ square of floor space. It is priced at $210, less motor, by the Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh, Pa.

DRILL PRESS, bolted and hinged to edge of saw table, swings into position. Belt from saw arbor drives 11″; four-speed press.

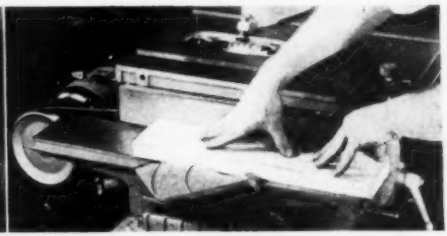


WIRE-WHEEL SANDER UNIT mounts on saw table and is belt-driven. Grinding wheels or a drill chuck can be mounted on same spindle.



SANDING DISK is 8½″ in diameter. Tilting sanding table has calibrations, slot for miter gauge. Sanding drums also can be used.

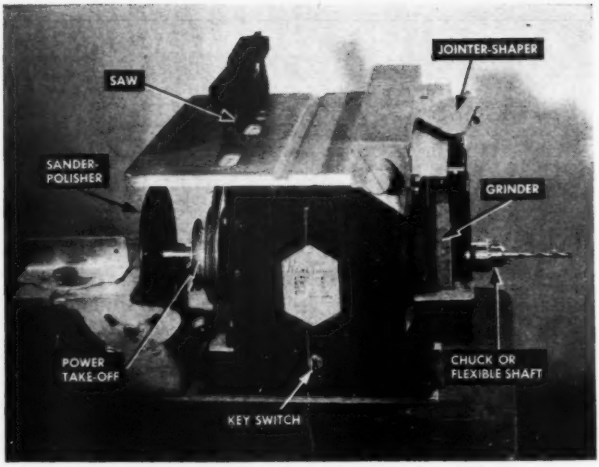
CIRCULAR SAW cuts to center of 48″ panel and has an 11⅝″ working area in front of the 8″ blade. Saw is tilt-arbor type.



JOINTER planes surfaces 4″ wide and rabbets ¼″ deep. Fence is 3″ high, 20″ long and tilts left or right 45°. Both tables are adjustable.

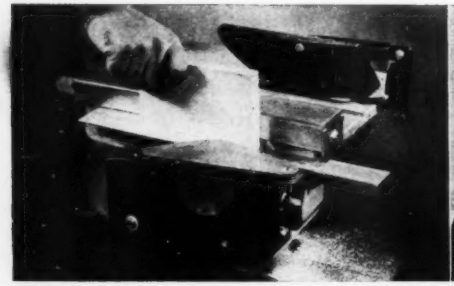
Please turn the page to see another multipurpose tool.

You Can Park This Little Job in a Closet When Not in Use

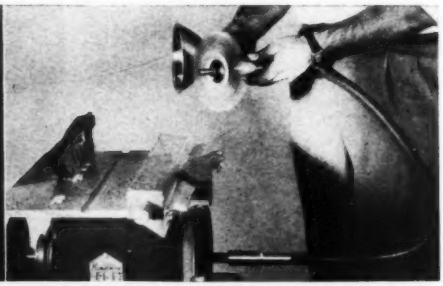


MULTIPLE JOBS this machine will handle are indicated at right. Tool measures 13″ by 15″ by 16″ and is powered by ⅓-hp. motor.

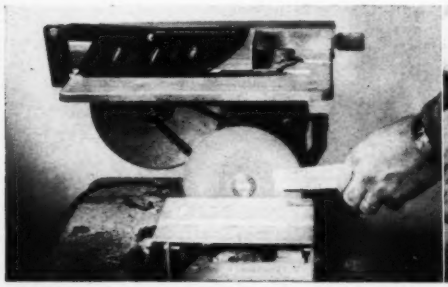
HERE is a compact, apartment-size unit that saws, grinds, sands, polishes, joints and shapes. You can stow it in a closet or sit it on a table or desk, since it weighs only 50 lb. The basic unit is priced at $75 and includes a 6″ combination blade, grinding wheel, sanding disk, wire wheel and a polishing bonnet. Accessory kits for the Handyman Shop range in price from $3.50 for a polishing-wheel kit to $18 for a flexible-shaft kit. The maker is Stanley Electric Tools, New Britain, Conn.



JOINTER will handle stock 1″ wide. Set of six shaper cutters are available as accessories to replace jointer cutter.



FLEXIBLE SHAFT attaches on same arbor as ¼″ drill chuck does. Chuck may be attached to end of 4′ flexible shaft.

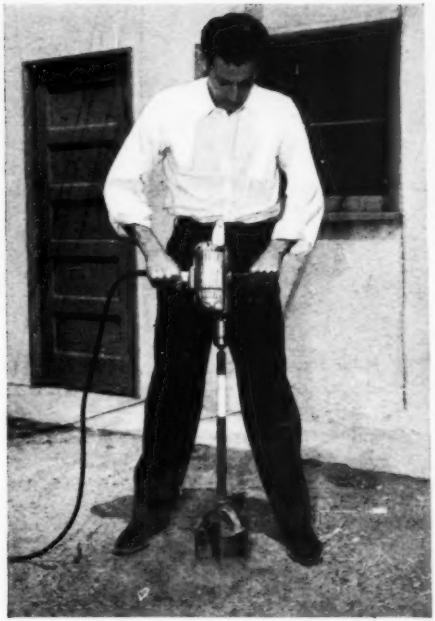


SANDING DISK can be replaced by a 6″ polishing wheel. Table of sander is adjustable. Miter gauge of saw fits on table of sander.

SO COMPACT a typewriter cover slips over it easily, tool cannot be started unless owner's key is inserted.

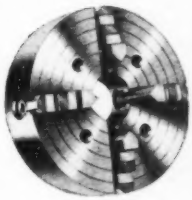
New Tools

1 Headlight. Batteries and bulbs are included in a new light that fits on your head. It throws light where the wearer looks and frees both hands for work. Its makers suggest that Brow-Lite would be useful to plumbers, mechanics, handy men and doctors. It also serves as an a to trouble light.

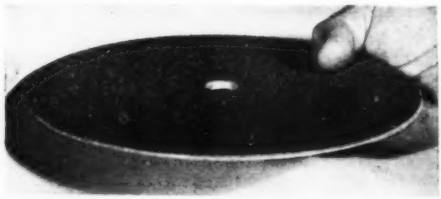


2 Drill Runs Post-Hole Digger. Lightening the task of making holes for fence posts, the digging tool above is powered by any electric drill of ½″ size or larger. A rotary cutting head on a shaft attached to the drill is said to do a fast, effective job in either soft or hard soil.

3 Cutter Shapes Cupboard-Door Lip. Lips on cupboard doors can be formed in a single operation with a three-wing shaper cutter. The tool is made in two styles—for use on a shaper and on a circular saw. It is made of high-speed steel and is available with or without carbide-tipped teeth.



4 Chuck Cuts Down Overhang. Because of the recessed back, this four-jaw chuck can be mounted to eliminate almost ⅝″ of overhang. This puts the work ⅝″ closer to the spindle, improving accuracy and permitting heavier cuts. The chuck is designed to be used with lathes of any size between 9″ and 16″.



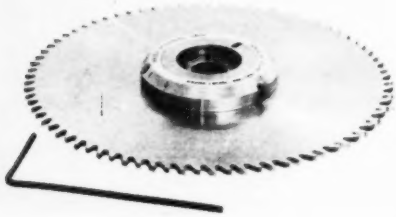
5 Sanding Disk for Saw. You can feed work to this disk just as you would to a circular-saw blade. The tapered edge of the disk straightens out irregularities in the work, leaving it ready for gluing. One side of the aluminum disk is covered with coarse, open-coat aluminum oxide paper and the other side with fine.

Please turn the page for more new tools.

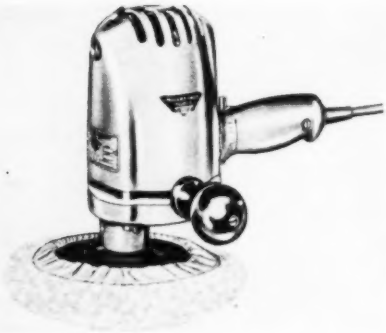
New Tools

6 New Jigsaw. A low-cost, motor-powered jigsaw cuts to the center of a 16″ circle and will handle wood as thick as ½″ and soft metals as thick as ⅛″. The motor turns up 3,400 r.p.m. The price is $12.95 and includes 22 patterns for projects.

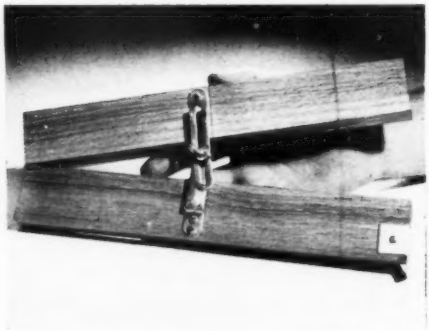
7 Screwdriver-Hammer. With its free-turning top resting in the palm of the hand, this tool serves at right as a T-handle screwdriver. Loosen a screw in the part between the fingers, and it slides to the other end and locks there to become the head of an 8-oz. hammer.



8 Saw Blade Cuts Dadoes. Adjustable gears in its hub convert this 8″ saw blade from a conventional one into an oscillating dado cutter for making slots or grooves in wood. Cuts of any desired width from 5/32″ to ⅞″, and as deep as 2″, are possible. To set the width, the wrench in the picture is inserted and turned in either of two hex sockets. The blade fits saws with ⅝″ or ¾″ arbors.



9 Versatile Sander-Polisher. A mirror-smooth finish is obtained when an orbital attachment is substituted for the 6″ buffer or sanding disk of the tool above. It does anything from rough sanding to finishing comparable with fine cabinetwork.



10 Taper Jig. This adjustable jig for cutting tapers on a circular saw is made of maple with arms 12″ long and 1¾″ wide. It will guide tapered cuts from 1° to 22°. For wider angles, the clamps can be relocated to move the arms farther apart.

Further information on these products can be obtained from: 1. Read Enterprises, 29 Read St., Lowell, Mass., 2. Eugene John Freeman & Co., Box 2143, Van Nuys, Calif.; 3. Woodworkers' Tool Works, 222 S. Jefferson St., Chicago, 6; 4. Buck Tool Co., 2015 Schippers Lane, Kalamazoo, Mich.; 5. Maynard D. Lee, 100 Chestnut Hill Dr., Rochester 17, N. Y.; 6. Burgess Vibrocrafters, Inc., 180 N. Wabash Ave., Chicago 1; 7. Spindriver, Box 1911, Los Angeles 36; 8. Magna Engineering Corp., Menlo Park, Calif.; 9. Millers Falls Tools, Greenfield, Mass.; 10. Hobbyist Adjustable Jig Co., 90-29 184th Place, Hollis, Queens, N. Y.

Pistol Cleans Windshield. A water pistol molded of plastic squirts liquid around the corner from the driver's seat to clean the windshield as the wipers work. The Misto-Matic reservoir holds enough water for a hundred washings, or it can be filled with a special deicing fluid. With the curved nozzle detached, the unit will slip into the glove compartment. *Products Research Inc., 171 Newbury St., Boston 16.*

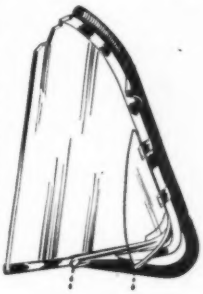
See Where You're Going

New car accessories improve driving vision in sunshine and storm.

Filter Reduces Headlight Glare. Screwed to the windshield molding, this colored plastic filter intercepts the beams of blinding headlights, yet gives vision past it. The filter slides up and down on a metal post to suit the vision height of individual drivers. *Olocar Light Controls Co., Box 23, La Grange, Ill.*

Regulator Peps Up Wipers. This new control is claimed to keep the blades going longer when the engine is under load, for instance on a hill. It evens out blade operation and ends racing of the wiper motor and blade whip at the end of stroke, thereby reducing wear. It is installed in the vacuum hose between the manifold and wiper motor. *Anderson Co., Gary, Ind.*

Rain Diverters Prevent Fog. If you like to drive with the vent wings open to prevent the windshield from fogging, here's how to keep the rain from blowing in. This new accessory, made of plastic and chrome, is designed to allow air to enter while carrying off the water at the two points indicated. *Anderson Lighting, 6341 S. Ashland Ave., Chicago.*



Plastic Strips Off Ice. A flexible plastic protector strips ice or snow off the windshield of your car after it has been parked in the open. A cloth edge keeps the plastic from tearing. The car doors are closed on the ends of the guard to hold it firmly in place on the glass. *Central States Paper & Bag Co., St. Louis.*

How to Build a Rev Counter for Your Car

Why a Tachometer?

Wonder how high the engine in your car winds up? This homemade $16 tach tells you.

By Howard G. McEntee

MANY racing drivers say that a speedometer is of little use to them—but they practically drive by the tachometer. Pilots and speedboat drivers agree that the tach is *the* indispensable engine instrument.

Now I have no intention of racing the family sedan, but I am curious about how high my engine winds up during acceleration through gears and at cruising, and what an automatic transmission does to the r.p.m. There are commercial tachs that will show all this, of course, but their $40-$55 tags stopped me cold. So I built my own.

It's a honey. You connect it with just one wire to the distributor or coil. It has no effect on engine performance and takes only a tiny amount of juice. Except for the meter it has no moving parts, and there's no dry cell to replace. The readings are "linear"—quarter-scale is 1,000 r.p.m., half-scale is 2,000 r.p.m., and so on.

It is made of ordinary parts, available from the radio mail-order houses, and will cost you about $16 if you have to buy everything. You don't have to be a radio expert to build it; a friend who is a novice with a soldering iron put his tach together in an evening.

Kinds of tachs. My first plan was to get an extra speedometer and link it by flexible cable with some rotating part of the engine ahead of the clutch. The tough job was to find this part. Using the camshaft would have called for fussy machining. Rigging a drive off the generator, water pump, or even fan belt would be awkward.

My next try was to work out a generator-type electrical tach. In this deal the engine spins a tiny generator especially designed to put out juice in exact proportion to its speed, with the output shown on a dash meter. But this didn't work out either: the equipment is costly and there's still a mechanical-drive problem.

Next I studied commercial tachs. One uses an ingenious switch or "sending unit" under the distributor cap, and another links the distributor to a "transmitter" that has a special high-speed isolation relay. Borrowing from these fine instruments was a little beyond me.

Circuit requirements. I jotted down what my circuit would have to do: 1. It should count the pulses in the ignition primary and report the rate on an inexpensive meter. 2. It should be accurate over the 450- to 4,000-r.p.m. range. 3. It must not affect engine performance. 4. It must not itself be affected by variations in battery voltage, plug gap or point setting—none of which is constant, even in one engine.

Test rig. On the workbench I put together a testing lash-up consisting of a standard coil and a distributor, spun by a variable-speed electric motor. An old mechanical tach gave comparative readings. This contraption isn't necessary if you build a tach like mine, but it is handy for experimenting.

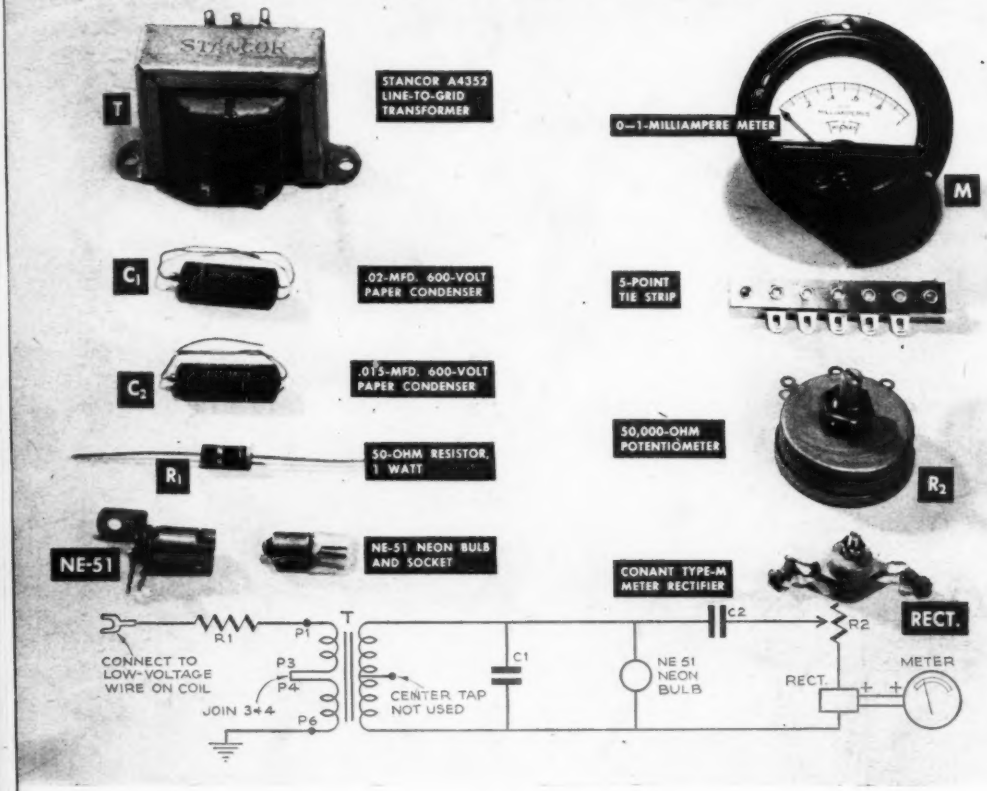
Construction. Decide first whether the meter is to be mounted separately or the whole unit is to be fitted in a single box. If you have a centrally located dashboard clock that's on the fritz—as many are—the meter may go nicely in its hole. A clamp bracket that secures the meter to the steering column is also neat.

For ease of wiring, all parts but the

A TACHOMETER is standard equipment on racing and sports cars, aircraft, and speedboats. It continuously reports how fast an engine is turning over. Installed on your car, it . . .

- **Reminds you to keep engine speed in the ranges for maximum fuel economy and engine life;**
- **Tells you when you let the revs climb too high, either on acceleration through gears or downhill engine braking;**
- **Demonstrates, on cars with automatic transmissions, how bad driving habits can make the engine wind up excessively;**
- **Helps you to tune your engine precisely, and reveals how different adjustments affect speed;**
- **Allows you, when utmost performance is needed, to "shift by the chart" like a racing-car driver. It tells you when to shift gears to hold engine speed near favorable parts of its torque and horsepower curves.**

These Are the Parts You Need



meter and the calibrating resistor are attached to the transformer and wired up before being put in the case. The long lug strip is soldered right to the top of the transformer mounting strap, and the neon-bulb socket soldered to the side. Make the connections mechanically secure before soldering with rosin-core solder.

When you have the parts wired, connect the tach leads to ground (the engine or chassis) and to either end of the low-voltage wire that runs between the coil and distributor. Rev up the engine and note whether the neon bulb lights up at high speeds. It should light without flickering when the engine revs up fast. If not, cut down the value of R1 until it does. The lamp will flicker at idling speed, once each time a cylinder fires, but that is normal.

The neon lamp stabilizes the circuit, tends to compensate for variations in the ignition system, and holds readings steady despite changes in battery voltage. Do not try to calibrate your tach without making sure that the neon lamp glows steadily at top engine speeds.

Scale. The values shown give speed readings up to 4,000 r.p.m. with an eight-cylinder engine. Actually, a range up to 4,500 or even 5,000 could be secured by readjustment of R2. But I figured that four quarter-scale divisions of 1,000 r.p.m. each would be most useful.

The common 0-1-ma. meter scale has five main divisions, on which it would be awkward to read a 4,000-r.p.m. range. I was able to substitute a scale from another meter having four main divisions, which works out fine. You can lick the same problem in several different ways:

- Calibrate the standard five-division scale to read 1,000 r.p.m. per division. (But un-

less you run a hot mill, this will crowd most readings over to the left.)

- Ink in a new scale on paper and cement it over the old one.
- Write to the meter manufacturer for a special scale—many makers supply them.

Calibration. If you are mainly interested in relative r.p.m., calibration is a cinch. Just adjust R2 so that the meter reads 450 to 550 r.p.m. at a warmed-up idle and you're in business.

To get accurate calibration, the quickest way is to take the car to an ignition shop or garage having an electric tach as part of its engine analyzer. Take along a couple of extra .01- and .005-mfd. paper condensers in case you need to change the value of C2.

Have the garage tach connected and bring the engine speed up to about mid-range, say, 2,000 r.p.m. Set R2 so that your new tach corresponds. Then try it at 1,000 and 3,000 r.p.m. If the pointer goes beyond at both points, you should raise the capacity of C2 and readjust R2 to center the pointer again at the midscale speed. If on the other hand the pointer doesn't quite reach 1,000 and 3,000 after having been set right at 2,000, C2 must be reduced in capacity.

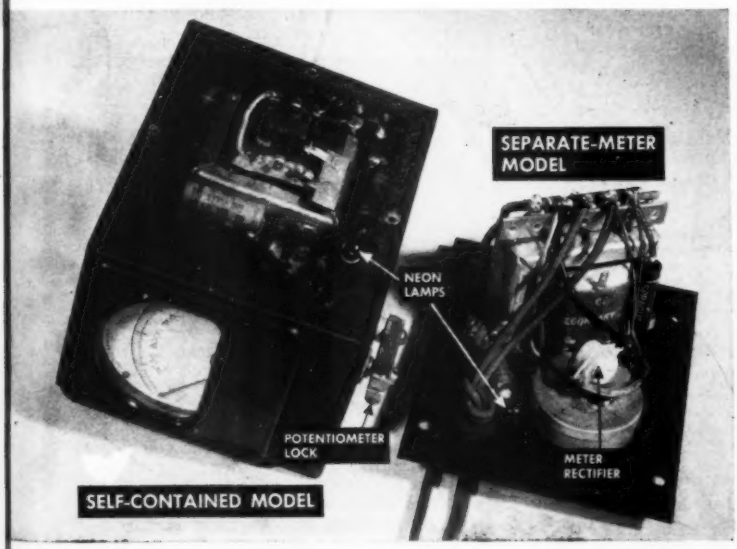
To increase C2, add .01 or .005 mfd. in parallel with the existing condenser. To reduce it, substitute a condenser having .005-mfd. less capacity.

Road testing is another way to calibrate your tach. This may not work very well in cars with hydraulic couplings or torque converters, but can be employed on any standard-transmission car, including one with overdrive. (If you have overdrive, lock it out for the test.) You need to know the rear-end ratio, usually given in the owner's manual.

Measure the distance the rear wheels turn in one revolution, calculate how many revolutions they make in one mile, and multiply by the rear-axle ratio to get engine r.p.m. at 60 m.p.h. You can then reduce this to a table showing r.p.m. in high gear at 20, 30, 40 and so on. Don't forget that many speedometers read high in the upper ranges, so if possible check yours first over a measured mile.

Fours and sixes. My tach was worked out for an eight-cylinder car. What about sixes and fours? A four has just half as many ignition pulses at a given speed as an eight, so a tach calibrated for an eight will read exactly half as high on a four. On a six, the readings would be reduced to 75 percent.

This means that if you want your tach to read 0 to 4,000 r.p.m. on a six-cylinder engine, you need a lower setting or lower total value on R2, and possibly an increased capacity for C2. For a six, use a .02-mfd. condenser and a 25,000-ohm pot; for a four, a .03-mfd. and 10,000 ohms. The values may not be on the nose for every car, but they will give you a start for calibration. END



Two versions of tach are shown here. One at far left is clamped to steering column by brackets on the side plate that is removed here. The other version is housed in metal box mounted in engine compartment, and wired to a meter set flush in dash. Nothing in tach is fragile or delicate, though meter should be protected from excessive vibration. Steel case is a standard radio part and costs 91 cents. It measures 3" by 4" by 5", makes convenient combined chassis-housing. Small card file would also do.

Winter Driving Tips

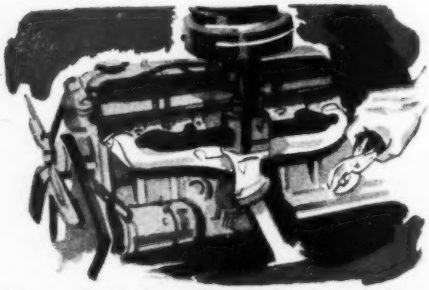
Wet brake linings caused by splashing water when you drive through a puddle can make your brakes ineffective or even useless. If you park and the water freezes, the parking brake may not release. Try to avoid slushy puddles; if you can't, drive a little with the brakes on to heat and dry the brakes. But don't drive too far this way.

If the engine steams but the radiator feels cold, stop at once and pour water into the radiator until you melt the ice that is blocking circulation. If you continue driving to melt the ice, you may cause serious damage to the overheated engine. Use melted snow in a pinch, but pour it in slowly and keep the engine running.

Change oil more frequently in winter than you do in summer. Cold starts rub tiny particles of metal off engine parts until the oil begins to flow. Carried by the oil, these particles act as abrasives all through the engine. Get rid of them by putting in fresh oil. Crankcase dilution is greater, too, another reason for frequent changes.

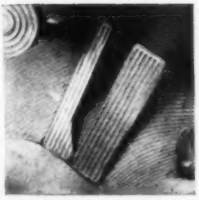
Snow damages a car more than rain because it splatters up underneath, rusting and corroding parts that rain cannot reach. Its action on chrome and paint also is more harmful than rain's. The remedy: frequent washing.

Poorer gas mileage can be expected because of higher friction losses, greater use of the choke and the longer warm-up time. You can't do much about *those* mileage robbers, but you can avoid show-off acceleration, excessive choking, pumping the accelerator pedal, stop-and-go driving and riding the clutch or brake.

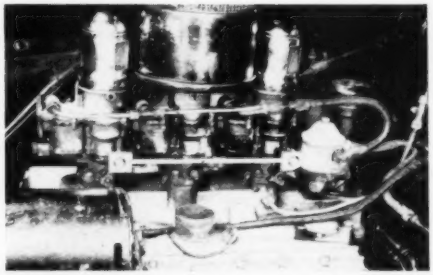


If you drain the radiator to protect it from overnight freezing, don't forget there's probably a drain cock on the cylinder block, too. Some people have forgotten—and paid for it.

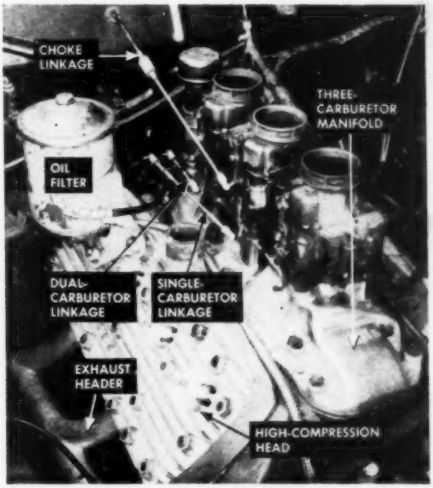
There is no truth to the statement you may sometimes hear that gasoline with a lower octane rating is more volatile and will give easier starting on a cold morning. Petroleum engineers say that the octane rating of a gasoline has no relation to its volatility.



TWO PEDALS are close together so that a slight rotation of foot permits desired carburetion. Left pedal works the dual carbs.



STRAIGHT LINKAGE, underneath and paralleling the gas line, joins throttle valves of the end carburetors. Air cleaners that offer less restriction to air flow are used on these carbs.



FULL DRESS and three carbs to boot. The linkage from the dual-carburetor foot pedal connects to a linkage (on the other side of engine) that operates end carbs simultaneously.

Two Accelerators Work Three Carburetors

I DRIVE my three-carburetor V-8 with two accelerator pedals. One controls a single carburetor for starting, moderate acceleration and cruising. The second cuts in the other two carburetors when I want a fast getaway or top speed.

My system thus combines the increased power output of multiple carburetors with the ease of adjustment, better economy, smooth idling and good low-speed performance of a single stock carburetor. In 25,000 miles of driving, I have not found any bugs.

Stock Ford carburetors were mounted on a three-carburetor intake manifold. Equalizing passages running lengthwise in this manifold split up the fuel-air charge.

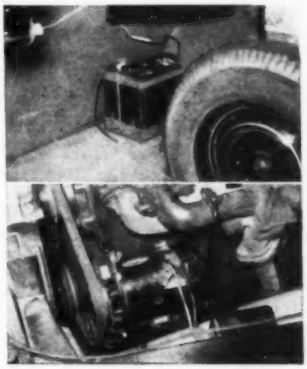
A simple coupling linkage was adjusted so that the throttle valves of the two end carburetors open and close together. On these carburetors, the idle-rate screws were backed out until the throttle valves close almost completely without actually wedging in the throats. Fuel to the idling jets was also blocked off so that, during idling, fuel and air are supplied to the engine only through the center carburetor. A choke valve and conventional air cleaner are used on this carburetor.—*R. L. Coffman, Arcadia, Calif.*

Car Has Extra Generator and Battery

ELECTRICAL accessories on my car will never leave the battery so exhausted that it can't turn over the starter. They operate on their own separate electrical system consisting of a battery, generator, voltage regulator and ammeter.

A bracket holds the second generator above the first, and a longer fan belt drives both. The second battery is carried in the luggage compartment.

The radio, heater, turn lights and a trouble light operate off the second battery. When the ignition switch is on, a relay closes, completing the circuit to the heater and turn lights. This prevents them from being left on while the car is parked. The radio is connected directly to the battery.—*Ray McNair, Buffalo.*



Gus Rescues

Gus was nearly frozen working on that stranded station wagon, but the courage and faith of ten little kids warmed his heart.

By Martin Bunn

BACK in town, Christmas Eve was filled with the old holiday magic. A feathery blanket of snow lay everywhere, and it was still coming down. Lights traced colored fantasies behind frosted, holly-decked windows. Here, the evening was warm with singing and children's dreams, touched with a quiet merriment as eternal as the light from that one Star seen a long time ago. But out on the open highway, an icy wind pushed against Gus Wilson's car with a force that gave the evening anything but a holiday flavor.

It wouldn't last long, though. Once he

Ten Little Angels

The small voices rose above the wind. "Silent Night, Holy Night . . ."

reached the home of Charlie Rheingold and his wife, where he had been invited to spend the holidays, the storm would no longer matter. Gus would let it cry in the eaves, while he enjoyed an open fire and waited for Christmas Day.

Gus Takes a Short Cut to Trouble

He snuggled into the new, 60-buck overcoat, a Christmas present to himself, and listened to the monotonous tick-squee of the windshield wipers. It was cold in the car, and he wished that there had been time to fix the heater before closing down the Model Garage for the holidays.

An intersection loomed vaguely in the wash of his lights, and Gus slowed to make the turn. The smaller side road was a shorter route to Eastville, the next town. It was just a bit beyond Eastville that the Rheingolds lived.

Gus passed an occasional bright-windowed farm house standing well back from the road. Then, gradually, the farm area

thinned away and the country became lonely, dark and remote in the storm. If he had been going any faster, Gus might not have seen the station wagon at the side of the road, with a half-frozen figure bent under the hood.

Station Wagon Is Stranded

Gus eased to a stop, backed up and asked if he could help.

"Mister," the man said numbly, "you sure could!"

"It's a bad night. Gus Wilson's the name. I'm a mechanic."

"I'm mighty glad to meet you, believe me. I'm Perry Wingate—lawyer from upstate. I was driving these kids to Eastville to sing in the church service tonight. The engine died on me all of a sudden."

Gus peered in through the windows and saw 10 small, solemn-faced children huddled close together on the seats.

"And this is Lydia Randolph, my fiancée. This is her Sunday school class." Gus nodded and the pretty young woman in the front seat smiled back cheerfully.

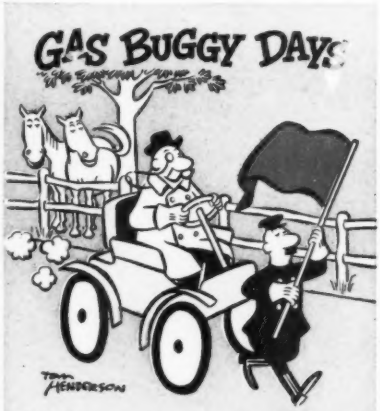
"The heater isn't working, of course, with the motor dead," Wingate went on. "I've got to get these kids out of here before they all get pneumonia. And they're going to be heartbroken if they don't get to the church in time to sing." He nodded hopelessly at the '39 Plymouth station wagon. "She acted just as if she'd run out of gas, even though there's plenty in the tank." Wingate looked a bit sheepish. "I haven't even got a tow-rope."

"Neither have I. Let me have your flashlight, and get inside while I look."

"Don't you need help?"

"I'll let you know."

"Okay, then. . . Say, would you mind if we crammed the kids in your car, with your heater?"



To make sure that no mechanical monster would ever imperil the beloved horse, the British Parliament once passed a law which stated that all self-propelled vehicles must be preceded by a man carrying a red flag.

"I wouldn't mind at all, except mine's on the blink. Haven't had time to fix it."

"That's rough. Well, I hope you have some quick luck."

Gus studied the situation. The nearest farm was some distance back. It would take two or three trips, and a lot of precious time to drive the kids back in his coupe—time that would completely erase the Christmas Eve plans the kids were counting on. He couldn't tow the station wagon, and the icy surface of the road made it too dangerous to try to push it. There was always the possibility that a car might come along soon, a car with a rope, but they couldn't take the chance of depending on it. Even if he removed his tire chains and used them to try to pull the other car, the wheels on his old coupe would just slip and slither on the hilly road. There was just no other way but to find the trouble.

Gus shrugged out of his new coat and made a rapid check of the distributor connections, the coil line, rotor and points. It took only a few minutes, but when he finished he was already shuddering with the cold that seemed to creep into his bones. He looked for bare wires, loose wires, anything that might cause a short, but there was nothing. Then he went around to the other side to check the carburetor. . .

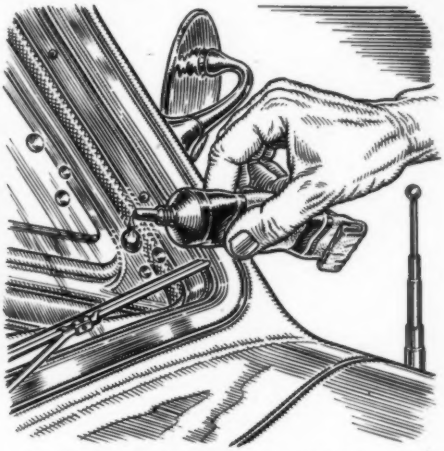
Gus Gets Some Unexpected Help

At first, it sounded like ghost voices in the storm. The children were sitting straight in their seats, their small voices rising above the wind. *Silent night, Holy night* . . . It was one way of saying thanks, one way of cheering him up and giving him a little moral support when he needed it badly. . . *All is calm, All is bright*. . . Gus smiled back at them. Now some of the bite seemed to have gone out of the wind.

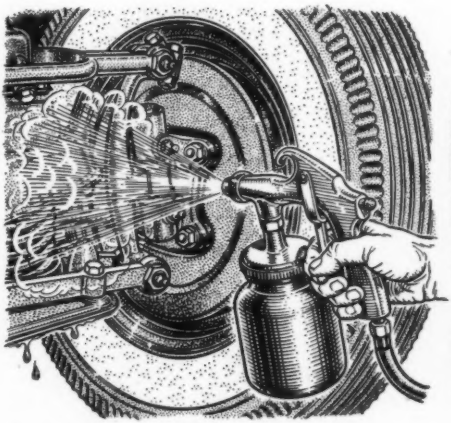
[*Continued on page 232*]

Hints from the Model Garage

After wax has been applied to a car and is ready to be rubbed down, you'll get a rave job if you dip the wiping cloth lightly in a pan of flour. The surface will brighten up with far less work with the polishing cloth.



Holes in windshields caused by stones or BBs are often conical ones with the small end on the outer side. To keep moisture from discoloring the safety glass, wash the hole with household ammonia, let it dry and apply transparent cement to both sides.



Grease can be cleaned off such parts as the front suspension, transmission or differential by using a paint sprayer to spray on kerosene. Allow the kerosene to soak in for a few minutes and then turn a water hose on the area full force.

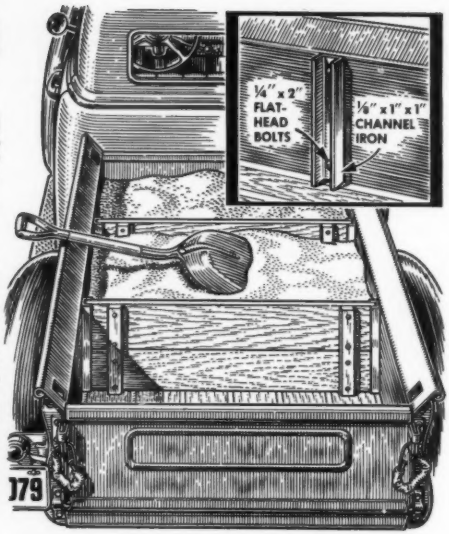
When his car began to burn oil, one owner lettered this legend on the underside of the filler-cap door. His car is driven by several persons, and the sign lessens the chance that someone will neglect to have the oil checked at each gas stop.

Please turn the page for more auto hints.

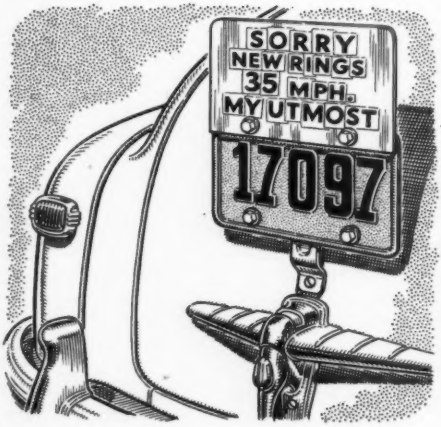
MORE Hints from the Model Garage

Wash mud and salt off your chains after each use and hang them up to dry. This will make them last longer. Even with proper drying the steel may rust some, but light rusting will not affect chain strength.

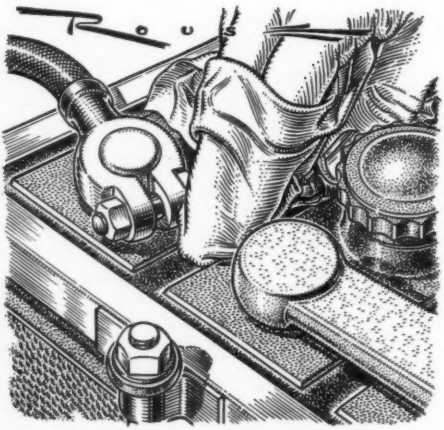
When one cross chain breaks, it is advisable to replace them all. If one has broken, others will probably soon go.



Sand and gravel or other different materials can be carried in a small truck at the same time without mixing if you divide the body like this. Install matching pieces of channel iron on opposite sides of the body. Cut division boards to slip into the channels. It may help to space each division to hold one cubic yard of material.



To avoid toots and angry glances after a ring job, one car owner bolted this sign to the rear of his car. He made the sign by cutting letters from a newspaper and cementing them to a piece of tin about the size of his license plate.



Wipe off dirt and moisture from the top of your battery occasionally. If too much piles up, it will form a leakage path between the terminals. Another tip: clean out the small vent holes in the plugs with fine wire from time to time.

HOT-ROD DICTIONARY

THE POPULAR SCIENCE MONTHLY HOT-ROD DICTIONARY is an entirely new work. It will, however, have for many persons the characteristics of an old friend; for it was compiled by William Callahan, editor of Motorsport Magazine and an authority on the lingo of track, shop, back-yard and armchair soupers.

No claim is made that the DICTIONARY embraces the full scope of the colorful jargon that hot-rodders use. No such work as this *ever* could be complete. Like a lusty infant, hot-rod language is growing all the time. New words and phrases are coined every day. Yesterday's often become obsolete today and we must caution the reader that some of these may have snuk into the present work.

Because strange words offer pronunciation problems, we have tried to show how those in the know say them. The key at the bottom of the page is based on Webster's New International, to which and to whom we make our bows and apologies.

A

al'ky (ăl'kē), *n.* Methanol, a volatile and inflammable liquid commonly known as wood alcohol. It is sometimes used as motor fuel in place of gasoline, esp. in racing events.

B

bald'y (bôl'dĭ), *n.*; pl. -ies. A tire from which the traction-producing treads have worn away, leaving the carcass as smooth as a hairless man's head.

bar'rel (băr'ĕl), *n.* A cylinder, or hole in the engine block where a piston moves up and down or back and forth.—Syn. See BORE, HOLE.

beast (bēst), *n.* Car with outstanding acceleration characteristics. One that gets away while the others are just thinking about it, or stirs up the dust first and fastest.—Syn. See BOMB.

bed (bĕd), *n.* Frame, or metal substructure, of an automobile on which the body, engine and passengers ride.

bel'ly tank (bĕl'ĭ tăngk), *n.* A car with the body built from a cigar-shaped World War II airplane drop tank. Only the axles and wheels extend beyond the tank.

bent eight (bĕnt āt), *n.* Any V-8 engine. Its cylinders are arranged in two lines of four, the lines being set at an angle to each other like the sides of a letter V.

bind'er (bīn'dĕr), *n.* The brake of a car, usually occurring in sets of four; as, he had his *binders* relined.

blow'er (blō'ĕr), *n.* A supercharger or compressor that increases the air pressure at the carburetor intake above normal atmospheric pressure. Ramming more air into the combustion chambers increases volumetric efficiency of the engine.

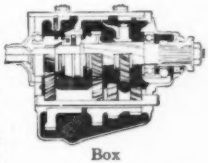
bomb (bŏm), *n.* A car that starts as fast and gets there as quickly as a projectile.—Syn. See BEAST.

bone (bōn), *n.* A Model A Ford.

boot (bo̅o̅t), *n.* A tire, so-called perhaps because both it and a man's wet-weather foot covering are made of rubber.—Syn. See GUMMY, SHOE, SKIN.

bore (bōr), *n.* An engine cylinder, not a dull person. — Syn. See BARREL, HOLE.

bore (bōr), *v.* To increase the capacity of a cylinder by enlarging its inside diameter.



Box

box (bŏks), *n.*; pl. boxes (bŏk'sĕz). A transmission or set of gears for transmitting engine driving force to the wheels in varying ratios.

C

cal'i·ber (kăl'ĭ·bĕr), *n.* A word sometimes used to describe the size of a cylinder.

cam (kăm), *n.* Short for camshaft, the rod with rotating projections that give timed movements to the exhaust and intake valves. —Syn. See STICK.

chan'nel (chăn'ĕl), *v.t.* To modify the body so that it can be dropped down and around and below the frame.

chan'neled (-ĕld), *adj.* A word describing

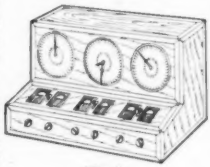
a hot rod on which the act of channeling has been performed. Hudson's Step Down is a channeled design.

cher'ry (chĕr'ĭ), *n.*; pl. -ies (-īz). A stock car in perfect condition.

chop (chŏp), *v.t.* To lower the over-all height of a car by removing sections of metal from the roof supports or side of the body and rejoining and welding the remaining parts together. Usually when this work is limited to the top or roof it is called chopping. If the body panels, doors and fenders are reduced in height it is called sectioning.

chopped (chŏpt), *adj.* Descriptive of a hot rod on which the act of chopping has been performed.

chopped fly'wheel (chŏpt flī'hwēl), *n.* An engine flywheel from which metal has been ground away to reduce the weight. The light flywheel has less inertia and aids acceleration.


Clock

clock (klŏk), *n.* An electrical device used to time cars in races.

col'umn shift (kŏl'ŭm shĭft), *n.* A lever for shifting gears, mounted on the steering column.

con rod (kŏn rod), *n.* Short for connecting rod. This rod connects the piston to the crankshaft and transmits the force from the piston to the crankpins in the crank throws, thus transforming reciprocal motion into rotary motion.

crank (krăngk), *n.* The crankshaft. Sometimes also called shaft.

crash box (krăsh bŏks), *n.* A transmission with straight cut or spur gears.

D

da'go (dā'gō), *n.* A front axle which has been stretched and the center section lowered in relation to the wheel spindles to lower the front end of the car.—Syn. DROPPED AXLE.

de·chrome' (dē·krōm'), *v.t.* To remove the chrome trimming from a car and fill in the holes with lead.

deck (dĕk), *v.t.* To remove chrome trim from rear trunk lid and rear of car.

de·stroke' (dē·strōk'), *v.t.* To reduce the length of the piston stroke of an engine.

dog clutch (dŏg klŭch), *n.* A positive clutch that is either fully engaged or completely disengaged. It cannot be slipped. It is used only in racing.

drag (drăg), *n.* An acceleration contest, usually between two cars but frequently run against a clock. Also sometimes called a drag race.

drag'gin' wag'on (drăg'ĭn wăg'ŭn), *n.* A car especially set up for drags.

dropped ax'le (drŏpt ăk'sl), *n.* See DAGO.

du'al set'up (dū'ăl sĕt'ŭp), *n.* An intake manifold especially designed for two carburetors. Some manifolds accommodate four or five carbs.

du·ra'tion (dū·rā'shŭn), *n.* Period of valve opening, usually expressed in degrees of crankshaft or flywheel rotation.

F

flat crank (flăt krăngk), *n.* A crankshaft on which the throws are all in the same plane on opposite sides of the centerline of the main bearings. Also known as a 180° crank. In contrast, most V-8 crankshafts are designed with the throws arranged at angles of about 90°.

four bang'er (fōr băng'ĕr), *n.* A four-cylinder engine.

four-wheel drive (fōr-hwēl drīv), *n.* A car in which power is applied through all four wheels.

french'ing (frĕnch'ĭng), *n.* A form of molding by which headlamp rims are smoothed into the fender line. The rims are usually eliminated.

front-wheel drive (frŭnt-hwēl drīv), *n.* A car in which the driving power is applied through the front, rather than the rear, wheels.

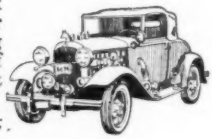
fu'el block (fū'ĕl blŏk), *n.* A device with multiple outlets interposed between the fuel pump and the carburetors to insure equal fuel pressure at each carburetor.

full house (fŏŏl hous), *n.* An engine that has been given the complete hot-rod treatment. It has everything the owner could buy or do to improve its efficiency and looks.—Syn. See LOADED.

G

goat (gōt), *n.* Just any old racing car, seldom the speaker's.

gook wag'on (gŏŏk wăg'ŭn), *n.* A car which has everything outside in the way of fancy ornaments, but nothing inside.


Gook Wagon

gum'my (gŭm'ĭ), *n.*; pl. -ies. A tire.—Syn. See BOOT, SHOE, SKIN.

H

head'er (hĕd'ĕr), *n.* A series of special tubes installed in place of the conventional exhaust manifold to lead exhaust gases smoothly away from the cylinders and reduce back pressure.

herd (hûrd), *v.* To drive a car.

high head (hī hĕd), *n.* An engine cylinder head designed to increase compression of the fuel-air charge. A high-compression cylinder head.

high-lift cam (hī-lĭft kăm), *n.* A camshaft on which the lobes are designed and ground to increase the valve lift and change the

valve overlap. Special grinds include: road, semi-race, three-quarter-race and full-race cams.

high-lift rock'er (hī-lĭft rŏk'ĕr), *n.* A rocker arm designed to increase the valve lift on an overhead-valve engine without installing a special high-lift cam.

hole (hōl), *n.* A cylinder.—Syn. See BARREL, BORE.

hot cam (hŏt kăm), *n.* A high-lift camshaft, usually of more extreme design than a road cam, the grind nearest to a passenger-car stock cam.

hot mill (hŏt mĭl), *n.* A souped-up engine, or any engine with a lot of zip.

I

in'sert (ĭn'sûrt), *n.* A steel-backed, babbitt-lined bearing which can be replaced in a connecting rod or main bearing.

J

jigg'ler (jĭg'lĕr), *n.* One of the rocker arms that actuate the valves in an overhead-valve engine.

jug (jŭg), *n.* A carburetor.—Syn. See POT.

juic'es (jōōs'ĕz), *n.* Hydraulic brakes. Ordinarily used in the plural only.

junk'y (jŭngk'ĭ), *n.* A hot rod belonging to someone else.

L

lake'ster (lāk'stĕr), *n.* A competition hot rod with a special body and no fenders. A belly tank is an example of a lakester.

lift (lĭft), *n.* The distance the cam lobe lifts the valve.

load'ed (lōd'ĕd), *adj.* Applied to an engine that has been burdened with all possible hot-rod accessories.

locked rear end (lŏkt rēr ĕnd), *n.* A rear axle in which the differential gears have been welded to eliminate the differential action normally used to compensate for the wider circle the outside wheel must travel in cornering.

low'er·ing block (lō'ĕr·ĭng blŏk), *n.* A metal block inserted between the axle and the spring seat to lower the body.

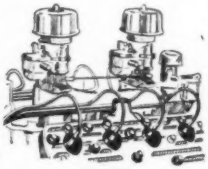
low'er·ing shack'le (lō'ĕr·ĭng shăk'l), *n.* Extra-long spring shackle designed to lower the over-all height of a car.

M

mag (măg), *n.* Short for magneto. In racing a mag is frequently used in place of battery ignition.

mill (mĭl), *n.* An engine.

milled head (mĭld hĕd), *n.* A stock cylinder head from which a thin slice of metal has been shaved or milled (in a milling machine). The metal is removed from the entire lower surface of the head. Since this reduces the size of the compression chamber, compression is increased—the object of the procedure.



Mill

mold (mōld), *v.t.* To fill in sharp corners where pieces of body metal meet so as to obtain a smooth curve.

N

nerf (nûrf), *v.t.* To push another car around.

nerf'ing bar (nûrf'ĭng bär), *n.* A bar, usually of ornamental tubing, installed in place of the bumper. It is used for nerfing.

nest'ed valve springs (nĕst'ed vălv sprĭngz), *n.* pl. Double valve springs, with the smaller one operating within the larger one. The object is to overcome valve flutter at high speeds.

ni'tro (nī'trō), *n.* Short for nitromethane, a high-powered motor fuel.

O

ohc (ō·āch·sē), *n.* Short for overhead camshaft, or an engine with valves operated by an ohc.

ohv (ō·āch·vē), *n.* Short for overhead valves, or an engine in which the valves are located in the top of the combustion chamber.

o'ver-bor'ing (ō'vĕr-bōr'ĭng), *v.t.* Sometimes used in place of boring, i.e., enlarging the inside diameter of a cylinder to increase its capacity.

o'ver·lap (ō'vĕr·lăp), *n.* The period when the intake and exhaust valves of a cylinder are both open.

P

pis'ton boss (pĭs'tŭn bŏs), *n.* One of the pair of internal knoblike protuberances in a piston into which the piston pin is fitted.

port (pōrt), *n.* The passageway which leads through the block (or head in the case of an overhead-valve engine) to carry the fuel-air charge from the carburetor to the cylinder, or to carry out exhaust gases.

port (pōrt), *v.* porting. To enlarge and polish the interior of a port to provide a free flow of the fuel-air mixture.

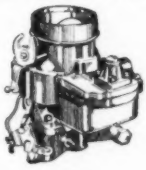
port'ed job (pōrt'ed jŏb), *n.* An engine in which the ports have been enlarged and polished.

pot (pŏt), *n.* A carburetor.—Syn. See JUG.

pot out (pŏt out), *v.i.* To have engine failure because of carburetor trouble.

pres'sure (prĕsh'ĕr), *n.* Sometimes used as a synonym for horsepower.

prune (prōōn), *v.t.* To defeat, as in a race.



Pot

push rod (pŏŏsh rŏd), *n.* A rod extending inside the engine from the camshaft to the rocker arm to transmit the lifting effect of the cam lobe.

Q

quick-change rear end (kwĭk-chānj rēr ĕnd), *n.* An axle housing with a removable cover to facilitate gear-ratio changes.

R

rail (rāl), *n.* A side member of the car frame.

re·lieve' (rē·lēv'), *v.t.* To grind away the metal ridges left between the valve openings and cylinder bores in a production flathead engine. About ⅛" of metal is removed, usually with a hand grinder. This lessens resistance to the flow of the fuel-air mixture from the intake valves to the combustion chambers, improving efficiency of the engine. But relieving also has a drawback. Since the combustion chamber is made larger, the compression is reduced. Relieving usually is not done unless the engine also is bored and stroked.

re·lieved' block (rē·lēvd' blŏk), *n.* An engine block that has been relieved.

roll bar (rōl bär), *n.* A heavy metal bar attached to the frame and extending over the driver's head to protect him from being crushed if the car rolls over.

S

sec'tion (sĕk'shŭn), *v.t.* See CHOP.

shoe (shōō), *n.* The rubber on which a car travels—one of its tires.

skin (skĭn), *n.* Same as shoe.

sleeve (slēv), *v.t.* To reduce the capacity of an engine's cylinders so that the car can be entered in a lower racing classification. The cylinders are bored and sleeves of smaller inner diameter are installed.

sleeved en'gine (slēvd ĕn'jĭn), *n.* An engine with sleeves in its cylinders.

slick (slĭk), *n.* A wide, smooth tire used in racing.

slug (slŭg), *n.* A piston.

soup (sōōp), *v.t.* To rework an engine to give it more horsepower, sometimes only by adding power-boosting accessories. Usually expressed as "soup up."

stack (stăk), *n.* A short pipe used to direct exhaust gases away from an individual cylinder. Short pipes used on carburetor intakes also are frequently called stacks.

stick (stĭk), *n.* A camshaft.

stick a foot in the pot. To open the throttle wide. The phrase might be used this way: "He stuck his foot in the pot and herded his goat to the head of the pack. He'd 'a pruned the field if he hadn't potted-out in the turn." This means: "He opened the throttle wide and drove his car into the lead. He would have won if his carburetor had not failed in the turn."

stick shift (stĭk shĭft), *n.* Usually signifies a car with a steering-column or floor shift lever, as differentiated from one with an automatic transmission.

stock by stock (stŏk bī stŏk), *adj.* Stock bore and stock stroke, i. e., an engine that retains factory measurements.

stock car (stŏk kär), *n.* A car in the condition in which it came from the factory.

straight-through pipe (strāt thrōō pīp), *n.* A muffler designed to keep power-robbing back pressure to a minimum. It usually is packed with steel wool and does not have the baffles found in a standard muffler.

stream'lin·er (strēm'lĭn·ĕr), *n.* A hot rod with a special body which encloses the wheels.

street job (strēt jŏb), *n.* A hot rod designed for comfort, looks and utility; not for racing.

stroke (strōk), *v.t.* To increase the distance the piston travels. In a Ford engine this can be done by substituting a Mercury crankshaft, which has the same bearing size but a ¼"-longer stroke. In other engines the crankpins are ground down (after sometimes being built up) so as to give them centers farther out in the crank throw. This pulls piston down farther, pushes it up more.

strok'er (strōk'ĕr), *n.* 1. An engine which has been stroked. 2. A driver who is not running his car at full speed; as, he's just *stroking* around, or, he's just a *stroker*.

su'i·cide sus·pen'sion (sū'ĭ·sīd sŭs·pĕn' shŭn), *n.* An axle mounted ahead of the frame rails by means of a transverse spring. The spring carrier is welded to the front cross member. If the weld lets go at high speed, the car will go end over end. Hence the name.

T

tac, tack (tăk), *n.* A tachometer, a device for registering the revolutions per minute of an engine.

t-bone (tē-bōn), *n.* A Model T Ford.

T-Bone

torched (tôrcht), *adj.* Applied to springs that have been reduced in height by heating with a torch and hammering into a new shape if necessary.

torque arm (tôrk ärm), *n.* A radius rod.

U

u-joint (ū-joint), *n.* A universal joint, or swivel joint placed in a drive line to transmit power even when the line is not in direct alignment with the source of power.

V

vir'gin (vûr'jĭn), *n.* A stock car in perfect *original* condition.

W

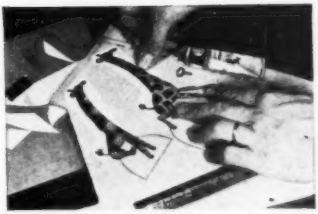
wild cam (wīld kăm), *n.* A camshaft of extreme design, i.e., grind, useful only for racing, not for road driving.

Noah's Ark Animals

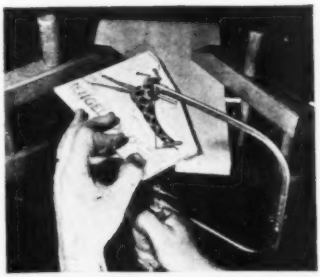
Turn Pictures into Toys

PICTURE-BOOK animals come almost to life as they file out of this Noah's ark, for that is just what they are—pictures cut from children's animal books and pasted on wood. The many books available provide as many choices as Noah had, from tame farmyard folk to wild jungle beasts, and you can turn out a whole menagerie for a few dollars and an evening's work.

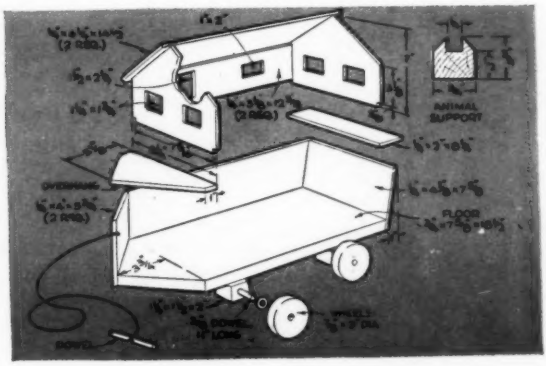
Mount the cutouts as shown at right, glue them into their slotted bases, and they're ready to board the ark. The ark is built in two parts—the hull and the cabin. The cabin can also be used as a house when taken off the hull.—*Karl Greif, Norwich, N. Y.*



CUT OUT ANIMALS to rough shape and cement to scraps of ¼″ plywood. Coat with varnish, let dry, then jigsaw to final shape.



BOARD WITH V NOTCH supports plywood for hand jigsawing. For strength, leave wood between legs and other breakable parts.



Miniature Photo Carried on Key Ring

A MINIATURE auto-license tag can easily be converted to a frame for a small photo. Remove the license number by bending up the prongs on the back and insert the photo. A piece of clear plastic will protect the picture. The frame can be carried with your keys, or several frames can be strung together to make a charm bracelet.—*John J. Rea, Urbana, Ill.*

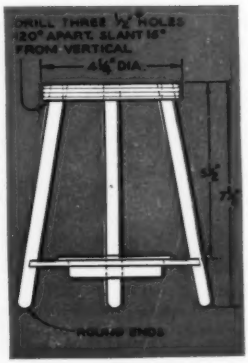
One Evening Shop Projects

A boy can practice making baskets and keep his room neat at the same time if a basketball wastebasket is mounted on the wall. The basket attracts not only wads of paper but the eye, too.

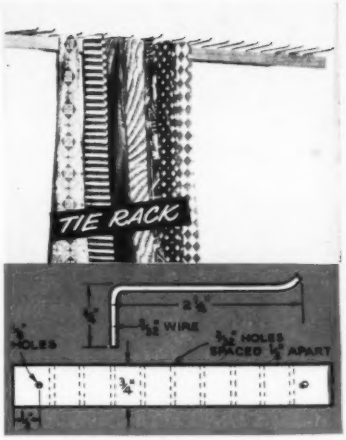
The backboard can be plywood or glued-up scraps and the hoop is easy to shape by hand. For the basket, use a mesh sack that oranges come in. Almost any grocer will give you one.

At the bottom of the net, insert a cardboard disk and sew it to the mesh with heavy cord. The basket can be hung on the wall with a length of wire and a picture hook.—*Paul Fryar, Long Beach, Calif.*

The unwieldy top of a vacuum coffee maker finds safe parking in the stand at left. Turn or saw the upper ring from ½″ stock, suiting the diameter of the hole to the sealing ring of the coffee maker. Bead or groove the edge. At 120° intervals, drill ½″ holes at a 15° angle for ½″ dowel legs glued in place. Make the lower shelf of ¼″ stock, notching the edges to fit the legs. Press a flanged ash tray or coaster into the central hole to catch drippings.—*John G. Voelker, Towson, Md.*



Shopping lists, photos and messages can be posted on an attractive but simply made bulletin board. The board is a slab of insulating board mounted on a frame of ¾″ lumber and then covered with burlap. Staple or tack the burlap to the frame. If you use a large piece of insulation, nail one or two vertical pieces into the frame as reinforcements.—*Andrew Takas, Levittown, N.Y.*

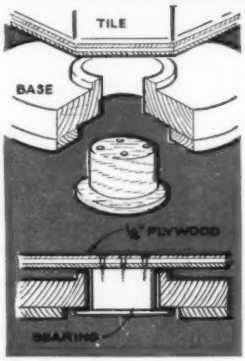


Ties on this rack hang separately and out of the way on the inside of a closet door. Cut a piece of ¼" by ¾" hardwood long enough to fit the door. Then drill the holes in which tie hooks will pivot for folding against the door.

You can bend the hooks from a wire coat hanger. File the upturned ends smooth and remove any burrs that might catch in the fabric.

Magazines stored in this stand will always be handy. You can place it on the floor or a table, or hang it on a door. The back is a piece of ¼" plywood 12" square, glued into rabbets in the 4"-wide sides and bottom.

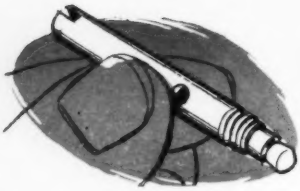
The grid is made of iron strapping—the kind used on packing cases. If you can't scrounge enough, you can buy it at a hardware store. Assemble it with rivets and nail on.—*B. Brownold, Cedarhurst, N. Y.*



Bright tiles in the top of this lazy susan add color to a table. Use four square tiles and filler pieces of nicely grained wood the same thickness as the tiles. Glue fillers to a piece of ¼" plywood and secure the hardwood frame with glue and screws. The bearing in the base is made of two burned pieces. Rub paraffin on the friction surfaces to make them free-turning.

Here's a new money-saving use for your camera and darkroom: putting a new face on an old clock.

I took the hands off a different clock that had a good face and photographed the face. Then I blew up a print to the proper size and cemented it over the old scarred face. A square of light cardboard was used to cover the center of the copied face as shown below.



Can You Change

It's not much harder than changing an

ONE dark night you may be jolted out of your sleep by a roaring gusher of scalding water and steam blasting across your basement for no reason at all. No reason, except that a water tank has overheated toward danger. Thanks to an ingenious little safety fuse, called a TPR valve, it has been kept from blowing up you and your house. (See "Water Can Be Dynamite," PSM, Feb. '51, p. 156.)

It could happen anytime, whenever an overheated coil, stuck thermostat or some other defect in the heater causes the water to get too hot. Now, before it happens, is the time to learn what to do if it does.

How the valve works. A TPR valve, as plumbers call it, is a two-in-one valve that lets water escape safely from the tank whenever either its temperature or pressure gets too high (thus T for temperature, P for pressure and R for relief).

The pressure half of the valve is a stem held tightly closed by a spring. If too much pressure builds up, it overcomes the spring and the valve opens to let the water out. The temperature half is a plug of fusible metal that melts away if the water gets too hot, letting it escape before it flashes into explosive steam.

Replacing the fuse. The fusible-metal plug is something like an electric fuse—once it has melted away, it's gone and must be replaced with a new one. Usually an extra plug is kept in a bag tied to the valve, but if you can't find one, better note the make and model of the valve and buy a few spares at a plumbing-supply shop. When you need one, you'll need it bad.

The photos on the opposite page show how a fusible plug is installed in one common type of valve. But there are many makes and models on the market, so a little study of yours now will save time later. And remember, a blown water fuse, like an electric one, is only a symptom of more basic trouble elsewhere. After you've replaced the plug, make sure that the original cause has been corrected before you attempt to fire up the heater again.

Know your heater. Not all safety valves are of the temperature-pressure type. Some relieve only under temperature, others only under pressure. Some electric heaters have thermostatic valves that open when the temperature gets too high, then close again to keep too much water from draining away and burning out the heating elements.

Find out from a plumber or heating expert exactly what kind of valve you have and whether it is giving you full protection. If you have the wrong type, or none at all, better get the right one quick.

And don't do what I once did. Mistaking a plain pressure valve for the TPR type, I proudly assembled the family and started to remove the valve cap to show them the fusible plug. After we dried ourselves off, we could laugh about it. But if the water had been a little hotter, it wouldn't have been funny.—*E. F. Lindsley, North Prairie, Wis.*

Stick Pushes Furnace Button for You

AUTOMATIC gas furnaces that require a starter button to be held in half a minute or longer while the pilot is lit are hard for one person to operate.

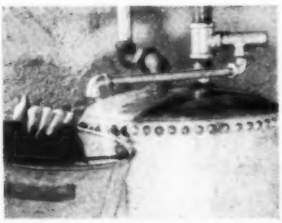
A short dowel cut to the right length and wedged in between the button and the floor (right) will hold it in for you. *Be very sure to remove the stick afterward so as not to leave the button pushed in.*

To keep the stick handy, drill a hole through one end, attach a hook bent from coat-hanger wire, and hang the dowel over the pipe near the button (left).—*Burl Knutson, Bismarck, N. D.*

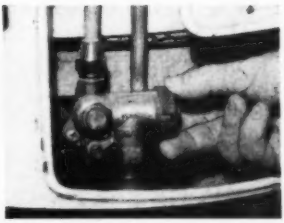
Your Hot-Water Fuse?

electric fuse—but may be a lot worse if you're caught unprepared.

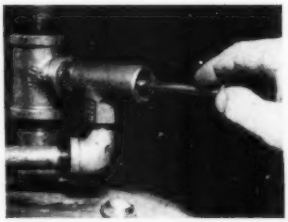
1. When valve blows, turn off water quickly, either at main house shutoff, as here, or at heater itself if yours has separate shutoff. Using latter won't deprive rest of house of water while repairs are made.



2. Bucket kept handy will save some mopping up, but be careful—water may be scalding hot. Better bet is to run a pipe to a floor drain or sink. Here, TPR valve is in tee (right above).



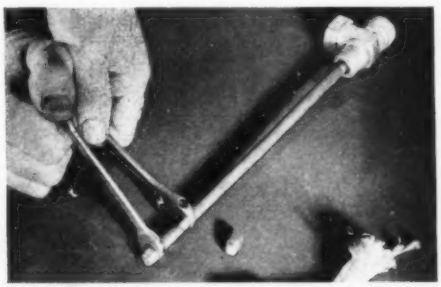
3. Shut off gas to heater to prevent trouble if unit is defective. Here, valve is at base, but others may be elsewhere. Know where yours is. If heater is electric, cut power at switch box (there may be two switches).



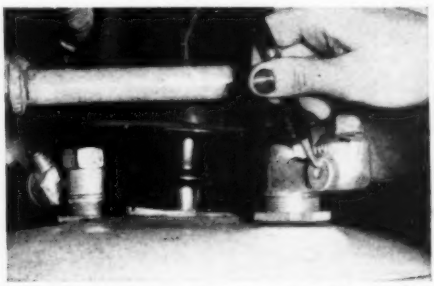
4. Remove cap from TPR valve, then unscrew small plug, as above, from center of large slotted plug. Do not disturb large plug; it has been permanently set at proper pressure by installer.

5. The empty chamber in inner end of small plug shows where fusible metal was before it melted out. Shine light into valve and make sure scale or rust will not impair seating of new plug.

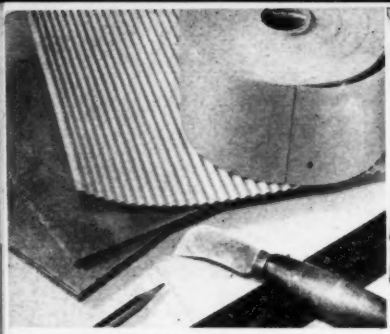
6. Insert new slug of fusible metal in plug tip and screw plug back in. Replace valve cap and job is done—provided you've fixed original cause. Always keep a spare plug in a bag tied to the valve.



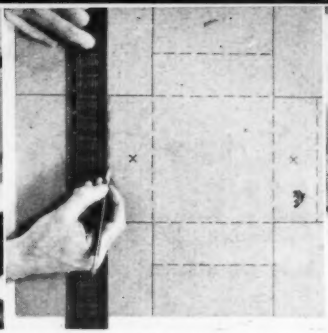
Another type of valve has long stem that sticks down into water. Since fusible metal is part of tip cap, entire valve must be removed from tank to get at it. Otherwise, replacement job is similar. Get to know what kind you have.



Partial installations aren't unusual. Here a plug (pencil) is where TPR valve should be, but pressure valve in left background gives some protection. Old practice under some codes counted on reversible water meters for protection.

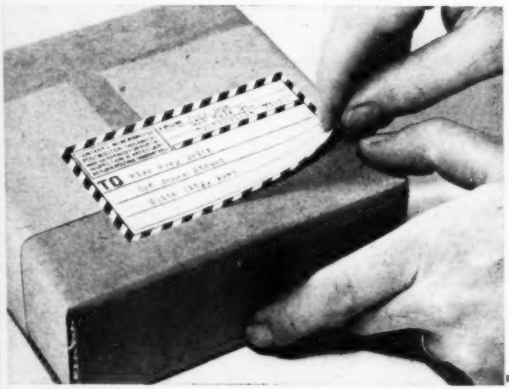


1 MATERIALS are double-faced corrugated cardboard and gummed paper tape. Unfaced flexible cardboard is good for lining only.



2 DOTTED LINES indicate folds, solid lines cuts. For a box 6″ square by 2″ deep, a sheet of 15″ by 18″ cardboard will do the job.

3 FOLD LINES can be scored with back of knife. Pressure should be firm but back of knife must not break through surface of cardboard.



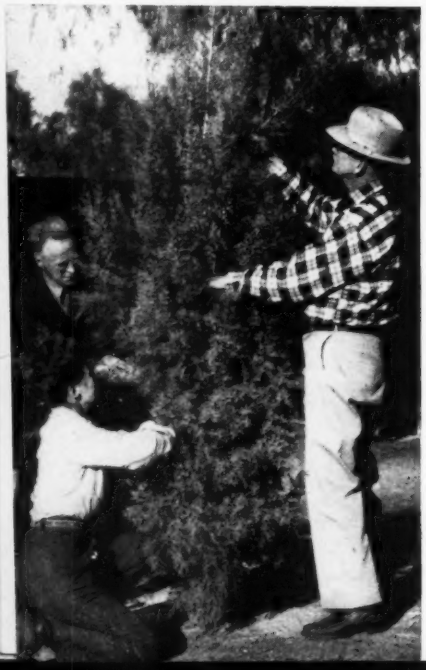
Cardboard

MAKE IT NOW FOR CHRISTMAS

Three simple

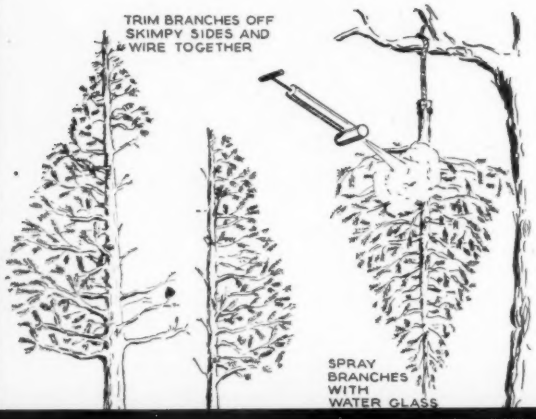
WHILE you may not believe that the holiday mails are shipped by concrete mixer, there's no need to put this faith to the test. Damage in transit can be largely eliminated by good packing, for most gifts

How You Can Fatten Up That Undernourished Christmas Tree



THREE skimpy trees made the full, symmetrical one shown in the photo at left. Trees often grow with sparse branches on one side. Lop off what branches there are on the weak side and wire on a healthier section from another tree. Check symmetry from several angles before cinching up the wire.

To fireproof a tree, spray it with water glass (sodium silicate). Then hang it upside down and spray the underside of the branches.



4 STEEL SQUARE or any straight edge can be used as guide to make bends. You'll have to flatten bent parts to make the next bend.

5 MARK TOP FLAP when box is closed tightly. Then unfold and trim excess off one flap so that the two top flaps meet neatly for wrapping.

6 PACK fragile articles in roomy box with plenty of shredded paper or excelsior. Sides can be reinforced by folding extra strip inside.

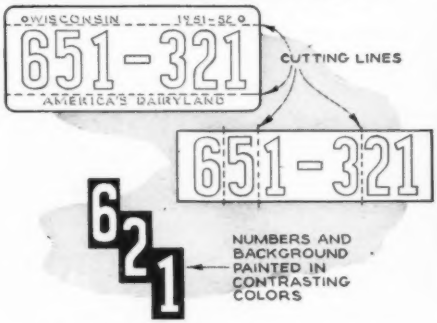
Mailing Boxes Protect Gifts

tools quickly change cardboard into sturdy shipping cartons.

a sturdy carton of corrugated cardboard.

Getting a box of just the right size is important; if it's too big the gift will careen around inside; too small and you have to skimp on protective packing. To make strong mailing cartons that are just right to package your gifts, follow the steps illustrated above. The only tools you need are a knife, square and pencil.—*Clyde L. Allison, Cadillac, Mich.*

Numbers Cut from Licenses

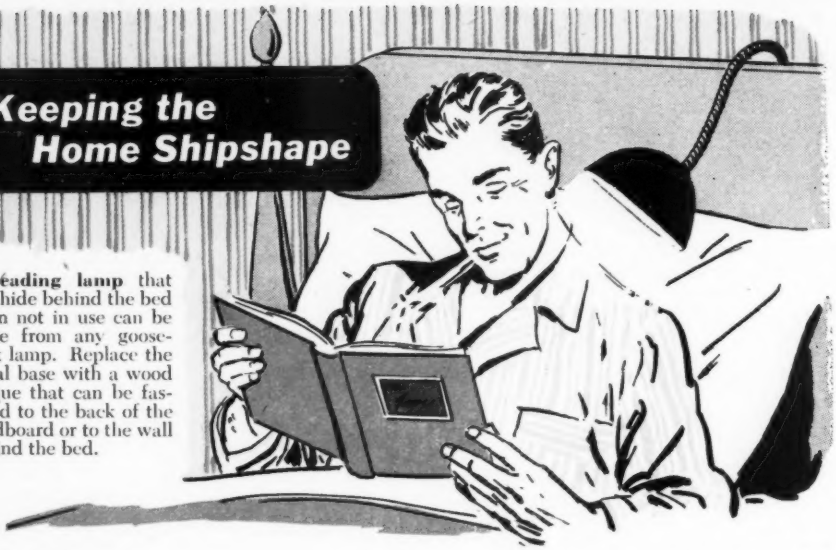


Old auto license plates are a handy source of embossed metal numbers for houses, cabins or boats. To keep the numbers from curling, cut them out in a line first and then cut them apart. Leave a uniform ¼″ margin at top and bottom. Drill small holes to mount the numbers with screws or nails.—*Thomas P. Ramirez, Fond du Lac, Wis.*

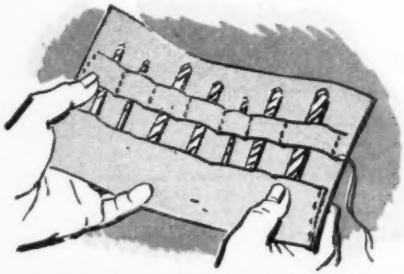
Burning Candle Changes Color

The flame of this candle will change color as it burns. Drill small holes ½″ apart down the side and fill them with small amounts of these chemicals: copper or barium nitrate for green; strontium nitrate for red; lithium chloride for purple; calcium chloride for orange; potassium nitrate for yellow and magnesium powder for white. Close holes with wax.—*Ken Murray, Colon, Mich.*

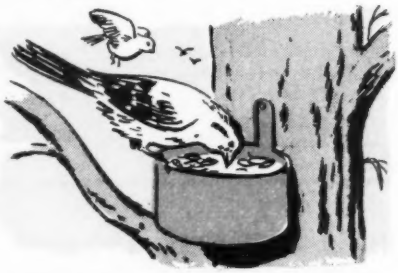
Keeping the Home Shipshape



A reading lamp that will hide behind the bed when not in use can be made from any gooseneck lamp. Replace the metal base with a wood plaque that can be fastened to the back of the headboard or to the wall behind the bed.

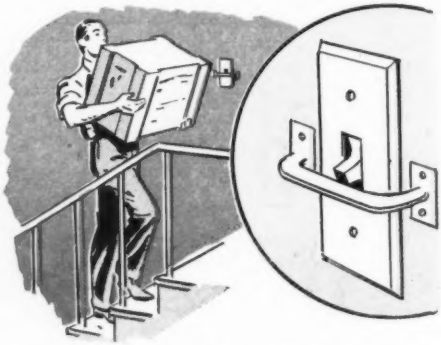


A drill case cut from a man's felt hat can be saturated with oil to protect the tools from rust. When rolled up for storage, the case takes up little room.



Weatherproof bird feeders are easily cut from plastic bottles. Snip a bottle at the halfway mark, leaving a tab at one side so that it can be tacked to a tree or pole.

When tying packages for mailing, dampen the cord or twine with a wet sponge to make a tighter job. When the moistened string dries, it will tighten up a little.



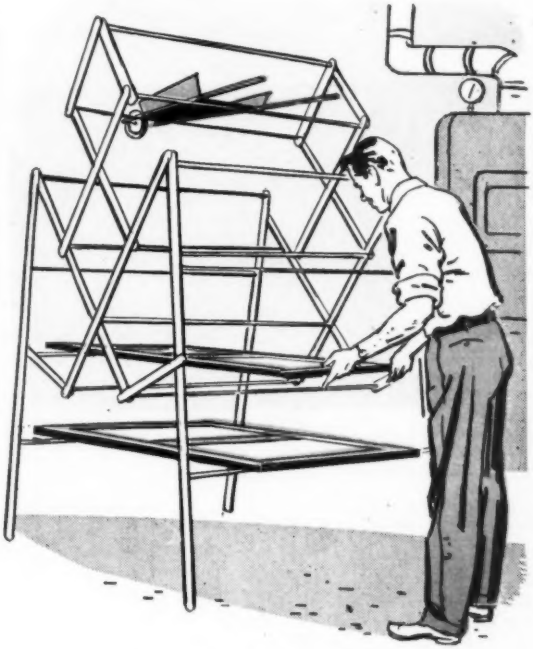
An oil-burner switch on the wall beside a basement stairway should be protected from large objects carried past it. A door handle makes a simple guard.

Stamp 'em fast with a mechanical licker and save your tongue when sending out batches of Christmas cards. A water-filled deodorizer bottle with fiber wick makes a good licker.

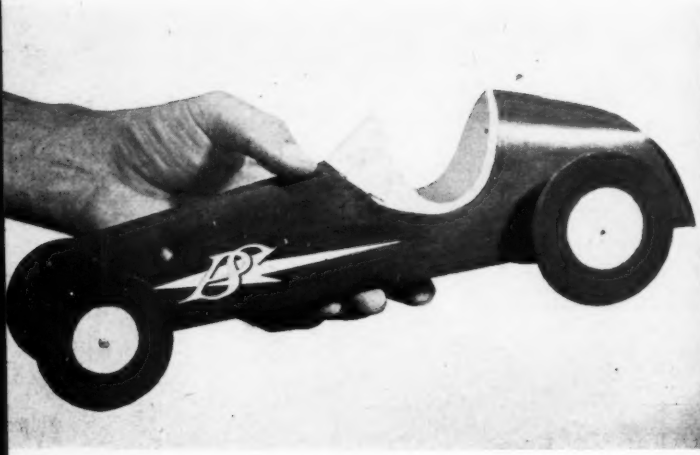
Wall out floor drafts and fence in toys by interweaving a strip of linoleum between the slats of baby's play pen. Overlapped rows of plastic webbing will do the same job.

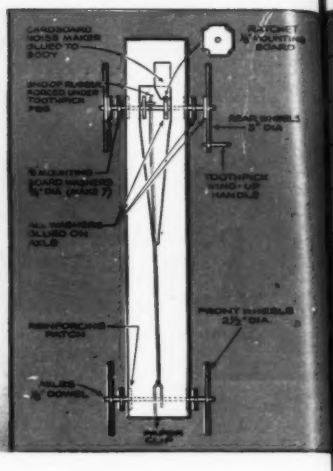
To tie a ribbon bow with a single knot, use a pushpin as an extra hand to hold the knot tight. Push it through knot and box, tie the bow tight and withdraw the pin.

To pour paint without a funnel, hold a stick or a pencil across the mouth of the pouring can. The projecting end of the stick will guide the paint flow.



A laundry rack makes a good stand on which to park freshly painted work for drying. Flat pieces rest across the bars; odd shapes can be hooked over them.

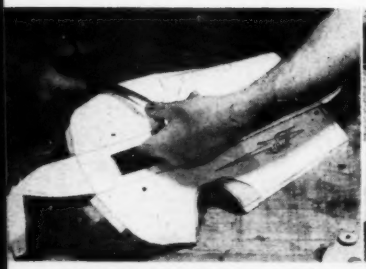




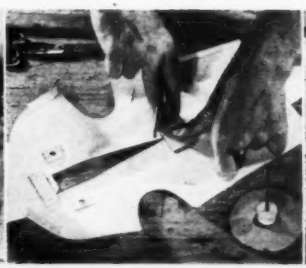
MAKE IT NOW FOR CHRISTMAS

Sturdy Cardboard Racer Has Rubber-Band Power

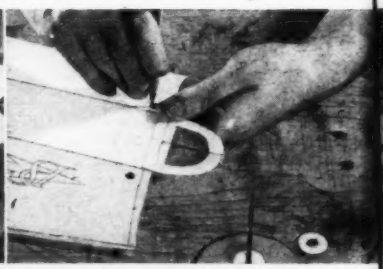
Though made of cardboard, this last-minute gift will last.



CUT OUT BODY after tracing plan on sheet of three-ply Bristol board. Score gluing flanges for easy bending. Draw in trim and details.



GLUE ON PATCHES cut from ⅛" mounting board to strengthen body at critical points and support axles. Apply glue with fine brush.

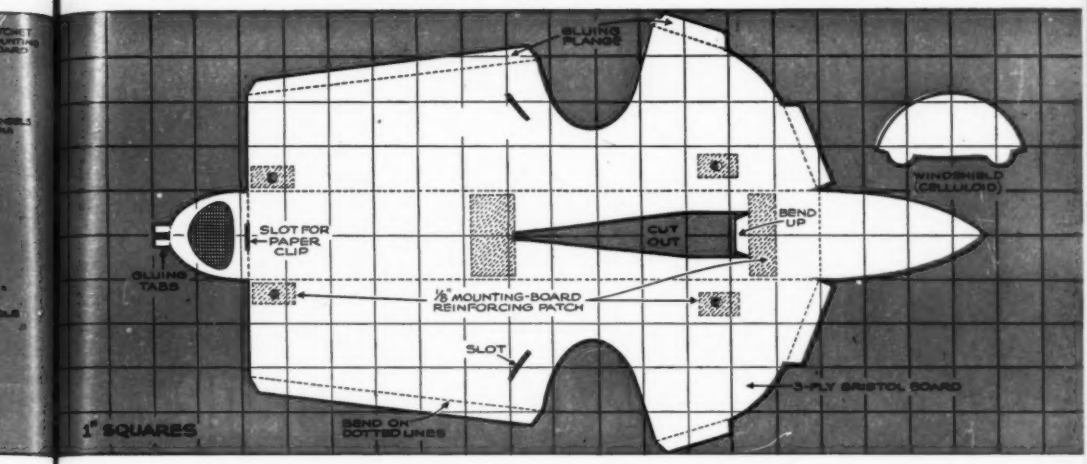


PUNCH HOLES FOR AXLES with sharp pencil or pointed dowel, then rotate soft pencil in hole to rub off graphite for lubrication.

Foil Foils Paint-Stuck Screw Tops

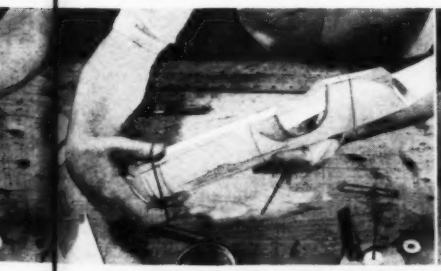
It is usually difficult to reopen jars containing finishing materials, such as aluminum paint. Dried paint in the threads causes the cap to stick. To eliminate this nuisance, replace the lid with two layers of aluminum foil over the jar mouth.

The foil provides an airtight seal, and when the lid is unscrewed again the slippage between the two layers will let the cap come off easily. Use fresh pieces of foil each time you replace the lid.—*Ken Murray, Colon, Mich.*



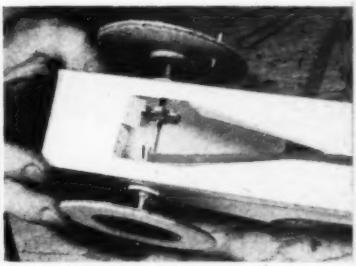
YOU can make one of these Bristol-board racers in less time than it takes to address a batch of Christmas cards. Painted with bright water colors, it makes a fine gift for a small relation. (Two of them are scarcely more trouble than one and permit exciting races in the hall speedway.)

A compass, razor blade and scissors are all the tools you'll need. For materials you'll want a sheet of three-ply Bristol board and some mounting board, both available in artist's-materials stores. Don't be fooled by the cardboard construction—it's strong and rigid.—*Wallis Rigby, NYC.*



BEND GLUING FLANGES OVER, apply glue and wrap body in rubber bands to hold it together while glue sets. Tabs on radiator are glued, too.

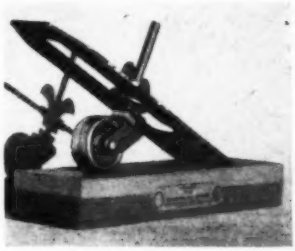
CUT WHEELS and axle washers from 1/8" mounting board and punch holes for axles. Axles are 3½" lengths of 1/8" dowel.

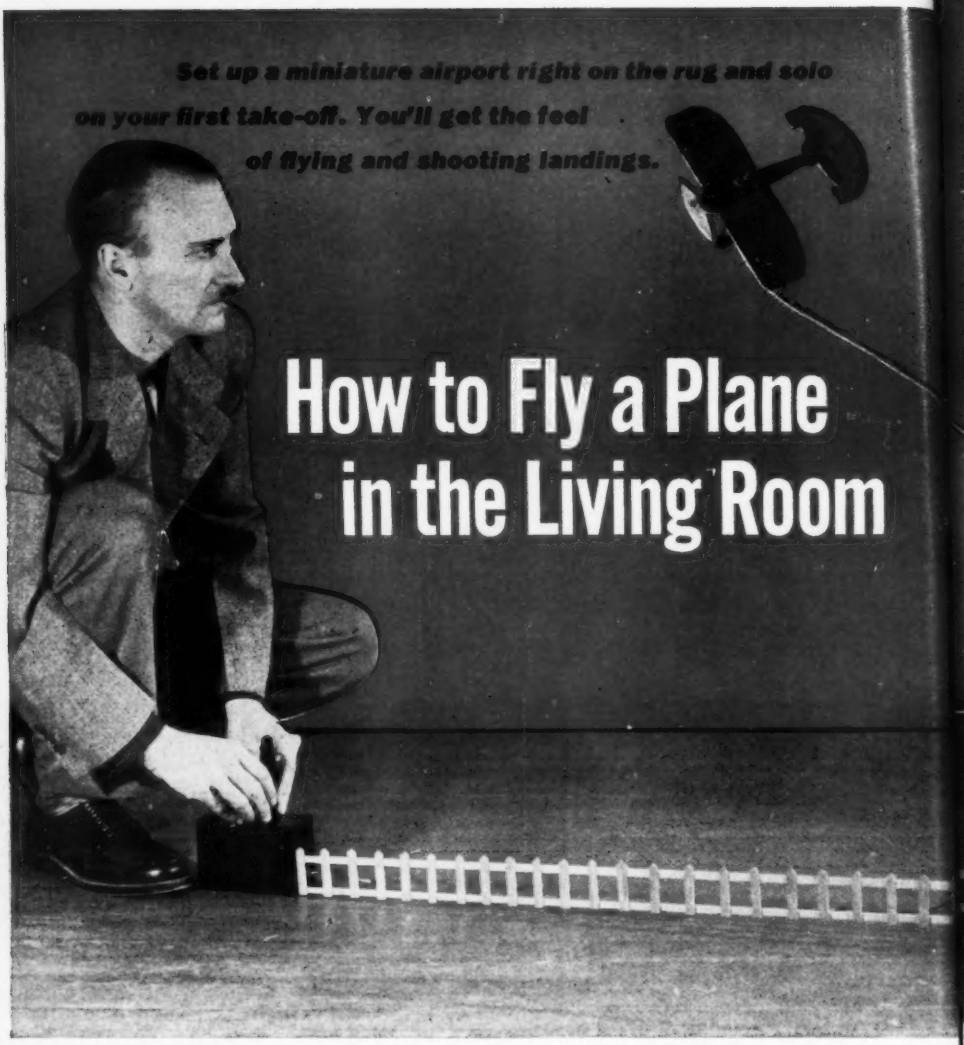


POWER is supplied by short chain of linked rubber bands. Car is wound up by rotating wheel with toothpick crank.

Plane Irons Sharpened with Rolling Guide

THIS rolling guide assures the proper angle when you are sharpening plane irons. Hacksaw the shank off a caster close to the saddle and punch out the remainder of the shank. Replace the shank with a ¼" by 2½" or 3" stove bolt. Run a nut down the bolt and tighten it against the saddle. A second nut, permitting adjustment of height, two ⅜" washers and a wing nut hold the plane iron at the correct angle on the stone.—*Wallace C. McDermott, Washington, D. C.*





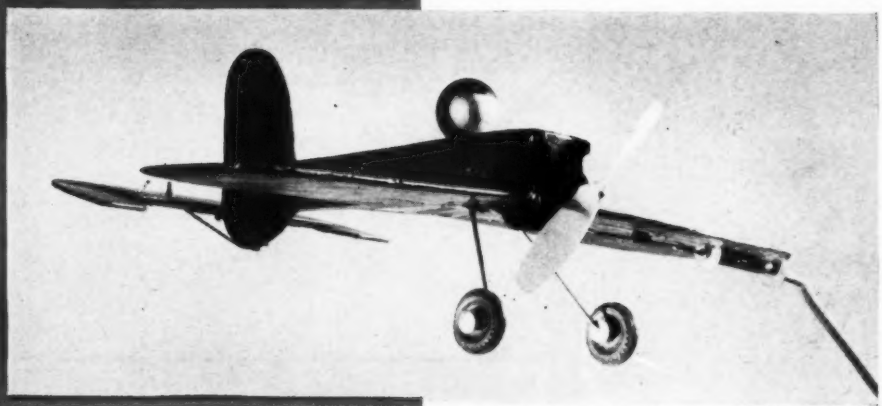
THE TIME: A midnight in December.
THE PLACE: Your own airport.
SANTA CLAUS TO TOWER: Flight XMAS approaching Your Town. Over.
TOWER TO SANTA: All clear. Use runway. Watch for new boundary fence. Over.
SANTA TO TOWER: Roger.

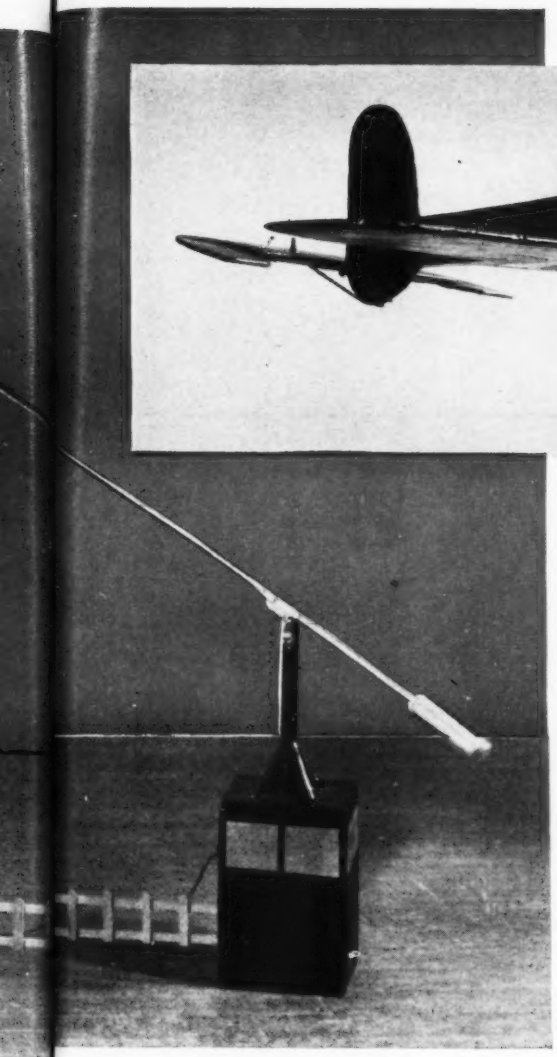
The plane buzzes the field once. Then the prop roar dies as the ship settles into an approach glide. It skins over the boundary fence, flares out, and drops to a perfect three-point on the runway.

Small feet scurry as the kids scramble for bed so you won't catch them at their Christmas Eve preview. But even if this plane comes as no surprise, you know that young fingers are itching to take the stick.

This fast-flying, responsive midget does just about everything a real plane does—takes off, stunts and lands. All you need to build it is an inexpensive battery motor, a curtain rod, a rheostat and a few scraps of wire, wood, tubing and metal.

Pylon. Make the base about 6" square





PLASTIC-CASED MOTOR, faired into front of fuselage, gives balsa plane plenty of zoom. Note rubber band that pulls elevator down.

and 8½″ high, of three plywood or cigar-box sides nailed to a top and bottom ¾″ thick. Into the top glue a ½″ dowel with a ¼″ hole through it, with about 1″ projecting.

Cement a 7″ length of ½″ fiber or plastic tubing onto the dowel and brace it with wooden gussets. Solder a washer to one end of a bit of ½″ thin-wall brass tubing as a retainer and slip the tubing into the pylon.

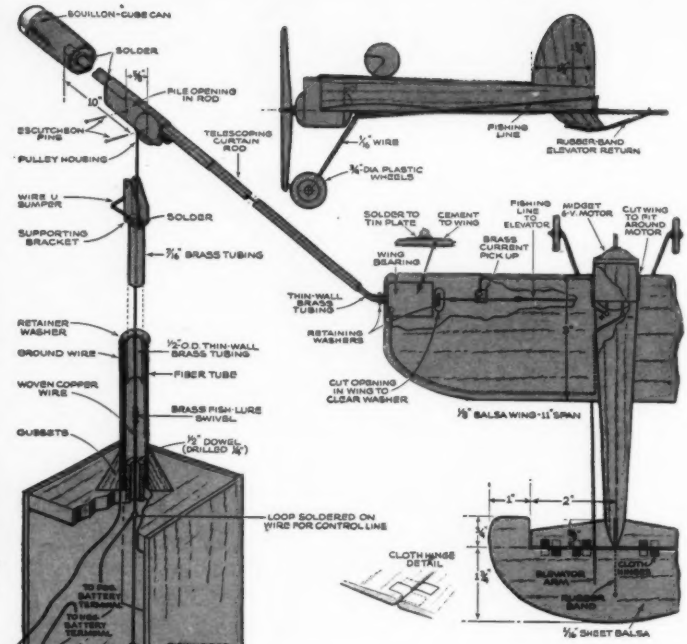
Swivel arm. Bend the pivot bracket from 1/32″ brass and solder to it a piece of 7/16″ tubing that will turn freely in the pylon. Run solder along the seam of a telescoping curtain rod and solder the two sections together into a 39″ length.

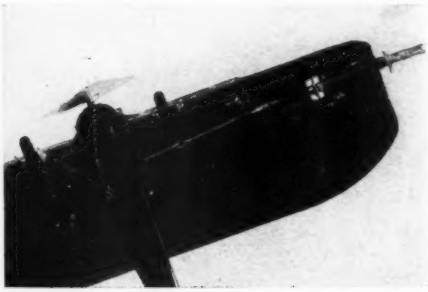
File a long opening in the thicker section and solder over it a pulley housing bent from tin-can stock. Center the ¾″-diameter pulley exactly ⅝″ from the pivot pin; this spacing will maintain elevator position at any altitude. Solder a bouillon-cube can to the end of the arm.

Wing bearing. Solder a few inches of ⅛″ tubing into the small end of the radius arm, bending the tubing so that it will be horizontal when the arm is lowered within 2″ of the floor. Solder the wing bearing, a short tube, to a piece of tin plate. Slide the bearing on the radius arm and solder on washers to hold it.

Plane. A miniature plastic-cased motor forms the nose. Cement a 1/32″ sheet-balsa fuselage to it. Attach the ⅛″-thick one-piece wing to the body at zero incidence. Solder the landing gear to a bit of tin and cement it under the wing. Cement the wing bearing on at a point that will make the plane balance fore and aft. Press a 4″ plastic prop on the motor shaft.

Control box. The throttle is a radio rheostat fitted with a ball-tipped lever. Add an on-off switch if the rheostat has no





SWIVEL HEAD (upper left) has a wire bumper to keep weight from fouling on pylon. Photo at right shows control line that runs from loop in flexible wire to the elevator.

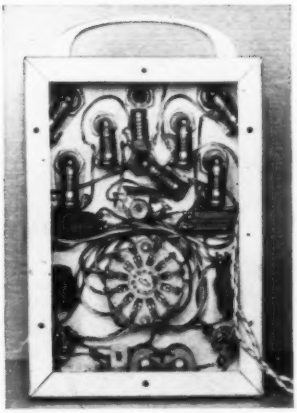
"off" position. Four flashlight cells in series provide power. One battery lead goes through the rheostat to the pylon bushing, where juice is picked up by the swivel bracket to go through the radius arm. A wire runs from wing bearing to motor.

The control line from the stick is tied to a short flexible wire, and the other battery lead is attached at the same place. Well below the pylon bushing, the flexible wire is soldered to a fish-lure swivel. From the top of this swivel a flexible insulated wire runs through the radius arm, emerging on the wing. It is stripped for 2" to run through a brass clip cemented to the wing as a current pickup. From the clip a wire runs on over to the second motor terminal.

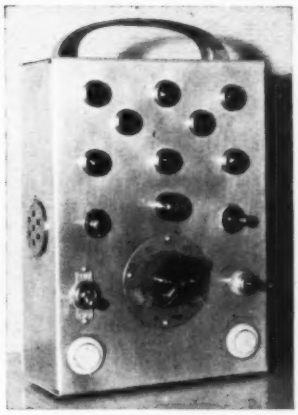
A thread tied to the stripped control wire runs around a landing-gear leg back to the elevator, which has a rubber-band "spring."

Balancing. Fill the bouillon-cube can with washers until it is ¼ oz. shy of balancing the plane. Add cotton to keep the washers from shifting. If the plane is nose- or tail-heavy on the wing bearing, shift the pilot (a 1" wooden ball) fore or aft.

Fence. The control box is spaced from the pylon by the airport fence to keep the control line taut. Make the fence of thin pine pickets glued to a pair of rails. Paint pylon and fuselage black, wing and tail red. *—Roy L. Clough Jr., Bristol, N. H.*



"Do-Nothing" Box Keeps Child Busy



MY UNPATENTED Electronic Dingbat has all kinds of switches and buttons that don't do a single thing except light tiny lights and buzz a buzzer. That's enough. For it keeps the junior-grade Edison in our house away from his usual rainy-day occupation—disassembling my electric clock.

A 10-position rotary switch, toggle switches and push buttons permit him to light up a variety of colored lights, either individually or in patterns. An ordinary six-volt buzzer supplies sound effects. A 2″ by 5″ by 7″ radio chassis was used for the box, the back being closed in by a sheet of ⅛″ aluminum screwed to the chassis.

Power is supplied by a six-volt A battery and the pilot light directly over the rotary switch indicates when the box is on.

Two views of the box give the general idea of what to put in it; your scrap box may give you more ideas.—*R. A. Piehl, St. Paul, Minn.*

Plating Kit Needs No Current

PLATING without electricity can be done on a small scale with a new kit. It includes six transparent plastic tanks, a rack to set them up in, and all the chemicals needed to apply four different finishes to copper, brass, iron or steel in less than a minute. Cleaning solution and lacquer are also provided.

The chemicals, which are mixed with water, supply their own electric current and are nontoxic and noninflammable.

The Easyplater kit sells for $8, and replacement chemicals cost 75 cents for each tank. *Yorktowne Special Products Co., 25 East Broadway, Red Lion, Pa.*

Records Teach Radio Code

IF YOU are studying for an amateur radio-operator's license, an easy way to learn code is through recordings. Two courses are offered: one with five recordings that is designed to teach up to 7½ words a minute and the other of 11 records to teach up to 18 words a minute. The records are two-side, 78-r.p.m. Fourteen written lessons are included to prepare learners for FCC examinations. *American Electronics Co., 1451 Wilkins Ave., NYC 59.*

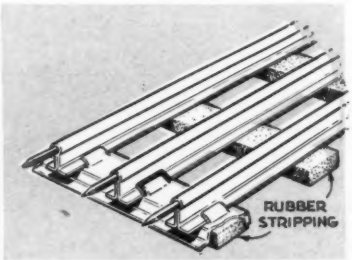
It's All Done with Mirrors. Double the size of your pike with a large mirror placed in a strategic corner of the layout. Aside from giving you two of everything for the price of one, the mirror presents an unusual effect as two trains seem to come from opposite directions, hit the curve together and race out of sight. To mirror a long stretch inexpensively, use a couple of ready-made door mirrors mounted on their sides.

Hints for Model Rail Fans

Signal Lenses. Gelatin prescription capsules—the kind the druggist fills with pink powder for pale people—make perfect lenses for locomotive headlights. Tint with bulb dye for homemade signals.

Diagonal Cuts Help Key Wires. Second cousin to a Chinese puzzle is the job of running the four-wire cable under the table from a tinplate operating track to the button controller. The wire is soldered to the terminals at both the track and the controller, making it necessary to unsolder four connections at either end and label them carefully for resoldering.

A much easier and foolproof method is to cut the cable on a sharp diagonal so that after it is run through the hole in the table the short wire on one side is soldered to the long wire on the other side and so on until all four are joined.

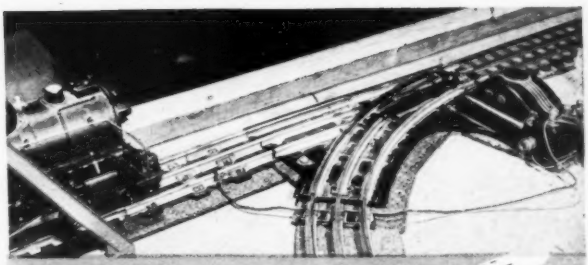


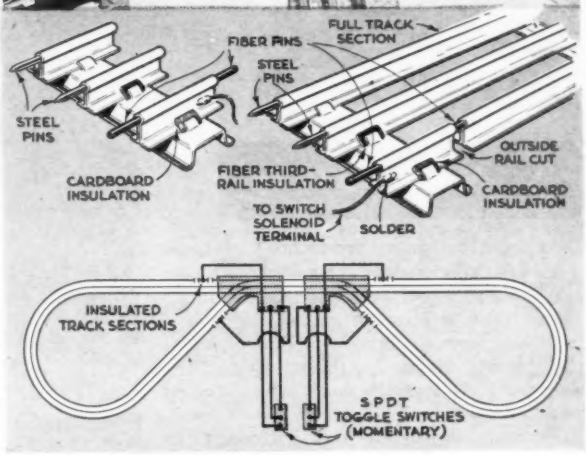
Soundproofing Track. Sponge-rubber weather stripping, obtainable at auto-supply and hardware stores, makes easy-to-install soundproofing for tinplate roadbed. It comes in several widths and thicknesses, but the ⅛″ by ⅜″ size is best suited to 027 track. Cut it into 2¼″ lengths, strip off the plastic backing and stick it to the underside of the crossties.

Fill in the spaces between the ties with a few extra lengths of the rubber strip to simulate additional ties for greater realism.

Switches Made Automatic. You can make your 027 switches automatic, just like the more expensive O-gauge type, by installing short sections of insulated track in front of the incoming legs. Each insulated section throws the switch points over to the proper direction as the first wheels of the train roll over it. The top sketch at far right shows an optional method of insulating a regular track section. Toggle switches are wired in for tower control.

In the point-to-point loop (bottom sketch) the train enters either side of the loop and, as it contacts the insulated track section, throws the switch to leave the loop. Coming back, it enters the loop in the direction that it came out and throws the switch to the opposite direction as it leaves. Such a setup lets a train shuttle over a varied route unattended.

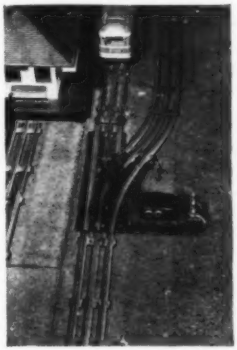


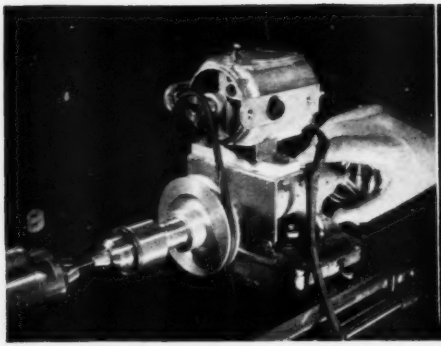


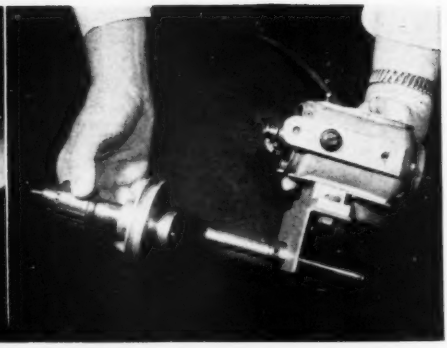
Crossing-Signal Coat Rack. This coat rack, made from an old clothes tree, gives an impressive greeting to visitors to your railroad room—and will also make junior trainmen happy to keep their duds hung up. Paint the rack and crossarms white and the lettering black. Screw one clothes hook to the end of each arm. Red trailer lights wired to the track circuit add to the effect.

Traffic for Model Highways. Shop the toy counter at the dime stores for miniature cars and trucks to add to your pike. Over-all length of an O-gauge auto is 4½" to 5", light trucks about 6", trailer trucks 12" to 15". If colors are too gaudy, refinish with model-airplane dope, painting in license plates for an added touch.

Cut Switches for Tight Trackwork. Sidings and double main line can be made more realistic by cutting the curved leg off a tinplate switch and replacing it with a matching section of track curving in the opposite direction. Two cut-down switches joined frog to frog give the impression of a complicated slip-switch arrangement and eliminate the exaggerated S curve that results when two regular switches are joined. You can also cut one or several legs off 45° or 90° crossings to make them fit an irregular layout or where several are used together.





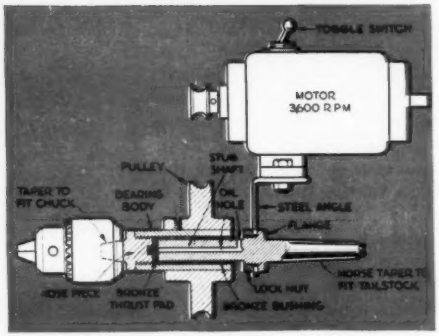


New Shop Ideas

Drilling Attachment for Lathe Tailstock. The high drilling speeds necessary with very small drills cannot be secured on ordinary lathes. This attachment spins the drill at a high rate as it is fed into work revolving in the opposite direction in the headstock. The actual drilling speed is the headstock speed plus that of the attachment.

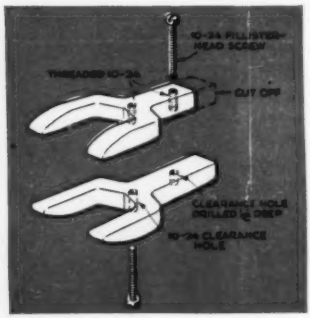
Turn and thread the stub shaft and taper shank from cold-rolled steel in one operation between centers. Insert it in the tailstock ram to drill the oil hole. Bore out the bearing body to take a bronze bushing; then bore out the bushing to fit the stub shaft. Turn the threaded end of the nosepiece first, drill it for the thrust pad and cut a thread to fit the threaded end of the bearing body. Chuck a piece of scrap brass rod and bore it to take the threaded end of the nosepiece; insert the nosepiece and turn the taper to fit the small Jacobs chuck.

Mount a 3″ pulley on the bearing body, boring it out if necessary to fit. Drill the steel-angle motor support to fit over the threaded part of the stub shaft and secure it in place with a lock nut.



Bolt the motor (a sewing-machine motor will serve) to the angle, fit the shaft with a sewing-machine pulley and snap a rubber sewing-machine belt over the assembly.

The chuck-and-pulley assembly slides onto the stub shaft and is held in place while idling by the rubber belt. When drilling, the thrust pad in the nosepiece bears against the end of the stub shaft.—*Dr. W. W. Lacey, Queens Village, N. Y.*

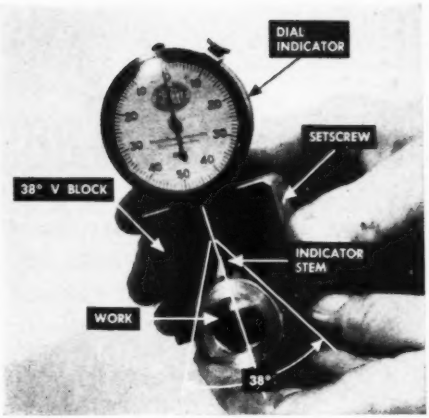


Four-Fingered Machinist's Clamp. Superior to the standard machinist's parallel clamp, this one holds the work firmly on *both* sides of the drilling area.

Both parts of the clamp are alike except for the longer shank on the lower one. The same pattern therefore will suffice to cast in bronze as many as you need.

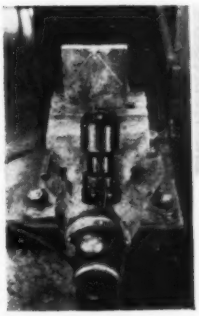
Lacking facilities for casting, the clamps can be cut from ⅜″ flat steel, brass or even dural. The rear adjusting screw sets the clamp to the desired opening and the front screw tightens it on the work.

Work is supported on the drill-press table by a block of scrap wood small enough to fit between the clamp fingers. —*Floyd McGuckin, Ridgewood, N. J.*



Dial Indicator + V Block = Production Gauge. A dial indicator set in a special V block becomes an adjustable gauge to show a difference in diameter or an out-of-round of .001″ in duplicate parts. The block is milled to an angle of 38° so that each .001″ on the dial equals .001″ difference in diameter.

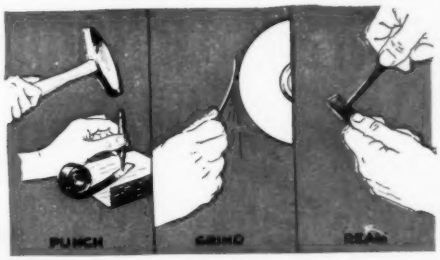
The indicator is inserted in a hole drilled in the center of the V block with the stem touching the sample part. It is then locked with the setscrew and the needle set at zero. If subsequent parts are oversize or undersize, the indicator will read the difference.



Vise Light. Working under an overhead light, it is often difficult to follow layout lines on work held in the vise.

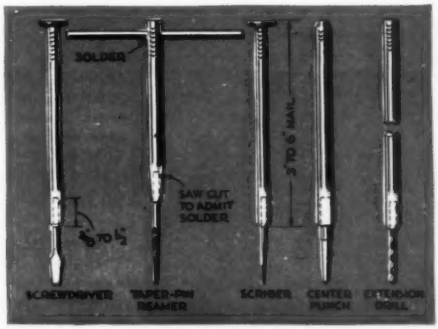
The spring clip shown will enable you to put a small night light on the work. A single rivet holds the two clock-spring clips together, permitting the light to be swiveled to either side of the vise.

The night light may be used as it is if the prongs are covered with electrician's tape. Otherwise cut the prongs off and solder the cord to terminals inside the base.—*Keith Heryford, Cedarville, Calif.*



Cutting Holes in Spring Steel. Drilling holes in flat spring steel for mounting screws is next to impossible, and annealing the spring and rehardening it after drilling is a nuisance. Here's a dodge that will save you time and tempering next time you need a hole in a spring.

Place the spring on a block of lead or hardwood and punch a depression in it with a center punch. This will raise a bit of material on the opposite side, which can be ground off to form a small hole. Ream this out to the desired size with the sharp point of a three-cornered scraper or a triangular file, working alternately from both sides—*A. Ferrand, Hawthorne, N. J.*

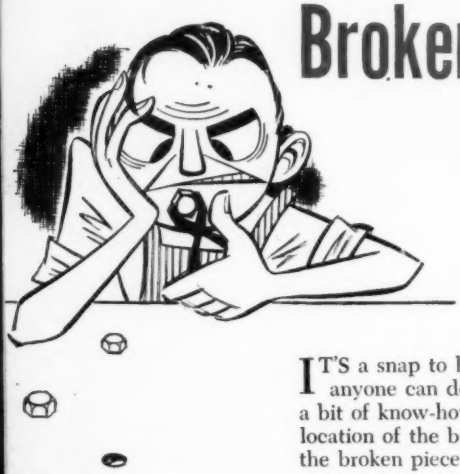


Small Hand Tools from Broken Drill Shanks. Save the shanks from those drills that occasionally get broken around the shop. Soldered into a husky nail (30-penny or larger) they become high-grade hand tools to supplement your tool chest.

Five examples of drill-shank hand tools are shown above. The hardened-steel shanks can be ground to shape or they can be annealed and filed, then rehardened and tempered. The screwdriver blade was hammered flat before shaping it.

A saw cut in the handle permits solder to flow into the hole to hold the shank securely. —*Edward J. Thatcher, Woodstock, N. Y.*

6 Ways to Remove Broken Screws and Taps



When any threaded piece breaks off in its hole, you're in a hole, too. Here's how to get out of it.

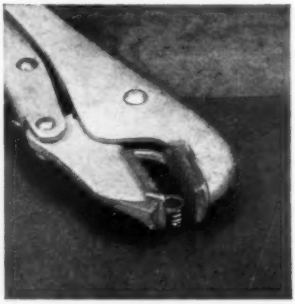
By Will Thomas

IT'S a snap to break off a screw, stud or tap in a threaded hole—anyone can do it. But getting the stub out of the hole calls for a bit of know-how plus a little luck. Depending on the nature and location of the break, one of the following methods should remove the broken piece. Try them in the order listed.

1 *Wrench or Screwdriver May Remove Lucky Breaks*

If enough of the piece remains above the surface to grip it with a tool, removal with a pair of cam-locking pliers is sometimes possible. But be careful not to chew up the stub into a hard-to-grip taper. If only ⅛" or so remains, hacksaw a slot in it and see if a husky screwdriver will back it out.

APPLY PENETRATING OIL regardless of the method used. Allow several minutes for the oil to penetrate as deep as possible. Even if the parts are new, oil will help.



CAM-LOCKING PLIERS will take a firm grip on a small part of the broken screw projecting above the surface, enabling you to twist it out with no damage to the hole.

2 *Tapping With Center Punch May Loosen It and Work It Out*

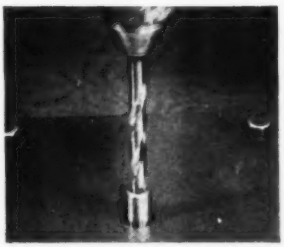
If the piece is flush or slightly below the surface, flood it with penetrating oil and try drifting it loose with a sharp-pointed center punch struck lightly at about a 45° angle. Continued hammering may expand the piece, adding to your troubles, so if the first few attempts fail to move it, *stop* and try something else.

CENTER PUNCH, tapped lightly with hammer, may jar the screw into rotation. If it does move, proceed gently, making sure that you keep the punch in the same spot.

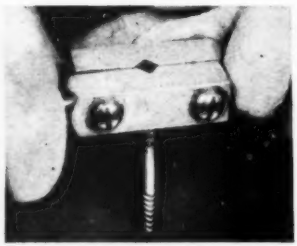
3 Screw Extractors Are Designed to Do the Job Without Damage

This is the safe way and works in the majority of cases. Screw extractors are available in a range of sizes for removing broken pieces from 3/16" to 3½" in diameter. A data card following this article lists these sizes and what to use them for. They are tapered and have spiral flutes running in a counterclockwise direction. Drill a hole in the center of the stub. Wait a few moments for the heat of drilling to dissipate and then drive the extractor into it with light, firm hammer blows. Tighten a tap wrench on the extractor and turn firmly in a counterclockwise direction. If reasonable pressure and plenty of oil will not move the piece, *stop* and use the next method.

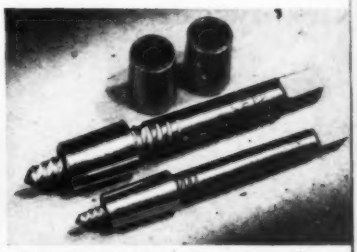
SCREW EXTRACTORS have flutes running in opposite direction from tap threads for backing pieces out. Some have flattened sides so the flutes form teeth for better bite.



DRILL GUIDE assures that hole drilled in broken screw will be centered. Some makers supply these with extractors. They are also simple to turn out in the lathe.

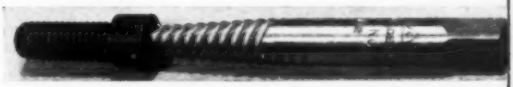


A TAP WRENCH, clamped on square shank of extractor after it has been driven into hole. is used to twist screw out. Avoid single-handled wrench —it may break extractor.



TAPERED COLLARS, forced on extractors, are used by some mechanics to prevent extractor from being driven in so deep that it expands top of piece, jamming it tighter.

ALLEN SCREWS with sockets so worn that Allen wrench will not turn them can be removed with screw extractor. Grind off point of extractor so flutes will grip shallow hole.

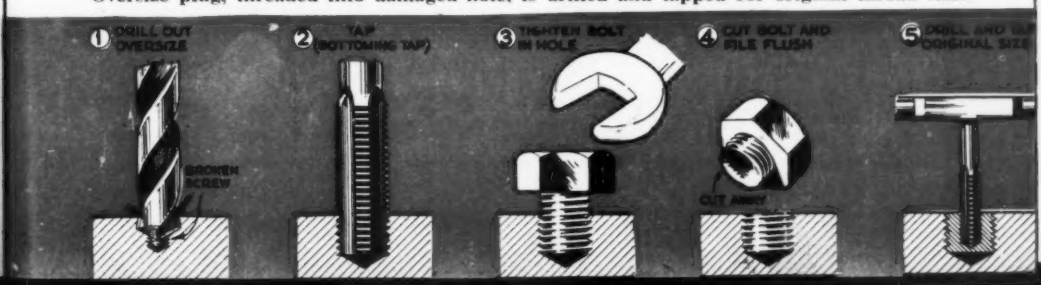


4 Drilling the Piece Out Will Permit Retapping the Hole

For stubborn cases and for broken-off screws smaller than 3/16" you may have to use this method. Center-punch the piece and drill it out with the size drill used for drilling the tapping hole for that screw. Then retap the drilled-out hole with a bottoming tap, taking care to enter the original threads. This should clean out the threads, but if they are damaged, you'll have to drill and tap the hole for the next larger size screw. If the screw *must* be the same size, drill and tap the hole oversize and fill it with a large plug. The plug is then filed flush with the work and drilled and tapped for the original screw.

Please turn the page.

Oversize plug, threaded into damaged hole, is drilled and tapped for original thread size.

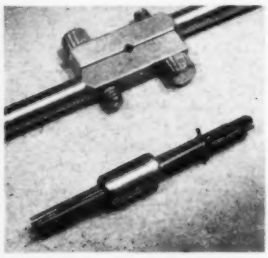


5 Tap Extractors Are Specialized Tools for a Tough Job

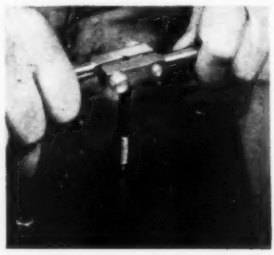
Threading taps, being hardened, will not respond to the screw-extractor or drilling-out methods. Occasionally, if the broken tap is not lodged too tightly, it can be drifted out by the center-punch method, but generally a tap extractor is a must. They are made in the same sizes as the taps and you need an extractor for each tap size.

Insert the prongs down into the flutes of the tap and press the collar down as far as possible. Clamp a tap wrench on the square shank of the extractor and turn with reasonable pressure in a counterclockwise direction.

If several attempts bring no results, *stop* and try the last resort.



TAP EXTRACTOR has sliding prongs that slip down between flutes of broken tap. Collar is pressed down so that it will hold prongs snug.



TAP WRENCH is used to turn tap extractor in same manner as screw extractor. Extra caution is advised as tap extractor is delicate and easily broken by too much force.

6 Break It Up or Grind It Out as Your Last Resort

This is your last chance and at this point it pays not to worry too much about the work—if you chew it up a bit, you can always thread in a large plug and then drill that for the original thread. Using slender cold chisels and punches first, try to break up the piece and remove it a bit at a time. Failing this, grind the piece away with an abrasive wheel slightly smaller than the hole. Mount the wheel in an electric drill and go light on the pressure or you'll chew up a lot of wheels.

GRINDING WHEEL, driven by electric drill, will grind tap stub away when all else fails. When stub is ground away, drill hole oversize for plug as previously outlined.

SCREW-EXTRACTOR SIZES

Screw extractors are made in numbered sizes to remove screws in the size ranges listed at right. Use the proper drill for each extractor. Drive the extractor into the hole until the flutes bite into the metal. Then clamp a two-handled tap wrench on the square shank of the extractor and turn firmly in counterclockwise direction.

Extractor No.	*For Screw Sizes*	*For Pipe Sizes*	*Drill Size*
1	3/16" to 1/4"		5/64"
2	1/4" to 5/16"		7/64"
3	5/16" 7/16"		5/32"
4	7/16" to 9/16"		1/4"
5	9/16" to 3/4"	1/8", 1/4"	17/64"
6	3/4" to 1"	3/8"	13/32"
7	1" to 1 3/8"	1/2"	17/32"
8	1 3/8" to 1 3/4"	3/4"	13/16"
9	1 3/4" to 2 1/8"	1"	1 1/16"
10	2 1/8" to 2 1/2"		1 5/16"
11	2 1/2" to 3"		1 9/16"
12	3" to 3 1/2"		1 15/16"

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

PATTERN FOR PERFECTION...

The best of materials, strict standards of workmanship, the finest tools—this is the real mechanic's pattern for perfection. Naturally, you, as a real mechanic, quickly recognize the work of others who measure accomplishment by the same standards.

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Bonney wrenches are the pride of the men who make them . . . the pride of the men who use them.

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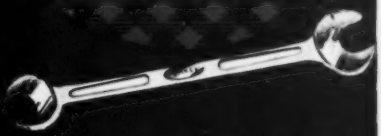
BONNEY TOOLS

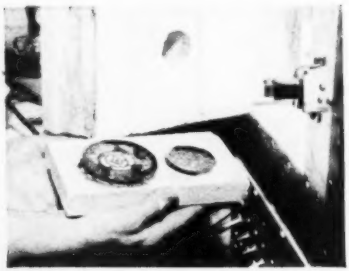


The skilled mechanic whose constant concern is with this pattern for perfection is exemplified in the men who produce the versatile tractors made by Buda, Case, Allis-Chalmers, Caterpillar, John Deere, Minneapolis-Moline, Oliver, and others.

Glazing with Glass Beads

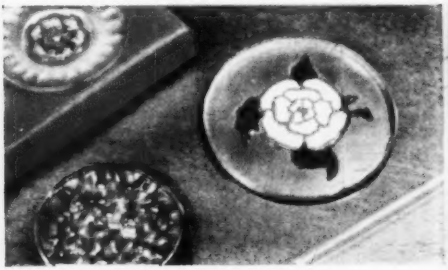
GLASS BEADS are arranged in designs on adhesive that holds them in place during firing. Beads will fuse into solid masses of brilliant color.

DESIGNS can be laid out on metal first or "painted" in freehand as above, using tiny brush dipped in adhesive to pick up the beads.



FIRING takes only few minutes. After slow cooling, clean off oxide with 30-percent nitric acid, then polish and coat with clear lacquer.

COLORFUL GLAZES decorate many ornamental objects. Pipe rack has striking desert scene glazed on metal back. Jewelry pins were made by heaping beads in center of metal leaf designs so they fuse into globs.



GLAZED ASH TRAYS are handsome as well as useful. One at right has pattern etched in metal; one at lower left has random mixture of beads.

THOSE brightly colored glazed objects that you've probably admired come high if you buy them and hard if you try to make them. But you can now get the same effects by using glass beads for the glazing material, arranging them in colorful patterns, and then firing them to a glass-smooth, sparkling finish. The beads, the ordinary kind used in bead-weaving, are cheap and come in all the colors of the rainbow.

The process was discovered accidentally by Eugene D. Walter, an art instructor at the University of Missouri. When he had a piece of ordinary glazing that he didn't like, he tried throwing on a few colored beads and refiring it.

Pleased with the brilliant spots of melted color that resulted, he next tried an all-bead glaze on a sheet-copper ash tray. He found that the beads fuse to a single, hard, shiny surface, they don't run as ordinary glaze powders often do, and they retain their original color, making it possible to see at the start how the final design will look.

Laying out the pattern. After the surface to be glazed has been carefully cleaned, as shown below, it is coated with gum tragacanth, a sticky adhesive, to hold the beads in place during firing.

An easy way to build up a pattern is to outline it first, then brush on the adhesive in only one color area at a time. Sprinkle on a handful of loose beads and they'll stick only where the adhesive is. The rest fall off and can be re-collected.

When the beads are in place, take the tip of the paintbrush handle and gently rearrange them so that they are packed closely together and the edges of the area are well defined. Then go on and apply the adhesive to the next color area, sprinkle on the beads, and so on until the pattern is complete.

Painting pictures with beads and firing them into bright, colorful glazes is an easy way to make handsome ornaments.

Firing. The pieces are fired at 1,700° F., the melting point of the glass beads, which is within the range of all amateur electric and gas kilns. While tiles and clay articles must be fired slowly, starting from a cold kiln, it's best to put metal objects into the full heat. The beads on small articles will take only four or five minutes to melt, and this fast firing prevents excessive oxide from blocking the beads' bond with the metal.

Special effects. You can get a startling kaleidoscopic effect with a random mixture of different-colored beads simply poured on and fired. If you want to glaze only part of an object, you can etch the pattern right into the metal. Areas to be left unglazed are coated with asphaltum and the piece deeply etched with nitric acid. When the asphaltum is cleaned off with ether, beads are placed in the etched depressions, fired, and the result is a hard, smooth glaze flush with the surrounding metal.

Another trick is to coat the entire surface with the adhesive and then "paint" in the picture or pattern you want, using the varicolored beads like an artist's palette. If you make a mistake, you just pluck out the wrong bead and put in the right one. If you want to change your mind, you just scrape off the beads and start over. You can't do that with ordinary glazing.—*John Trimble, San Diego.*

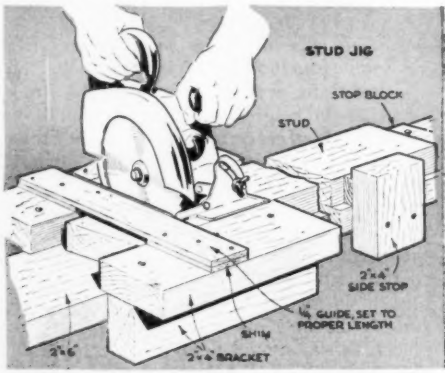
SIMPLE ASH TRAY for glazing is circle of sheet copper pounded to concave shape with wood mallet and sandbag. Copper should be at least 24 gauge to prevent warping during firing.

METAL IS CLEANED before beads are put on. Use 30-percent solution of nitric acid to remove dirt and grease so that glaze will make firm bond. Keep acid off hands and clothing.

Jigs Save Saw Time

By Edwin M. Love

THE portable saw itself is only half the outfit. To increase its cutting speed and make it do jobs that could not be accurately done freehand, there are a number of jigs you can build. They will support the saw and guide it with all the accuracy of the more precise, but less convenient table saw or radial guide. Build a table for it, too, to convert it into a tilting-arbor table saw for cutting and beveling small work. Photos on these and the following pages show you how.

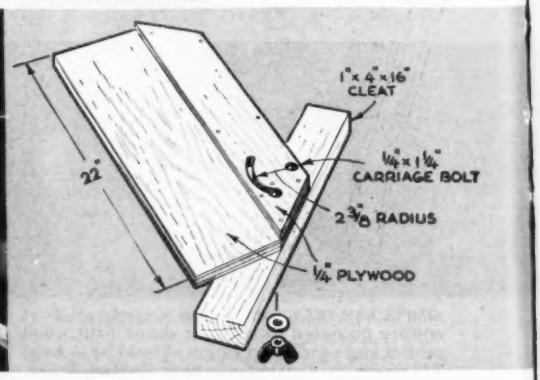


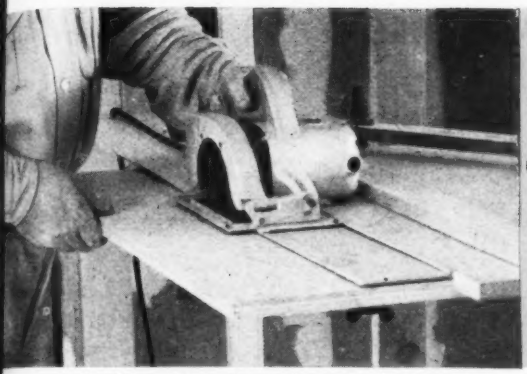
Cutting studs to length. Set up on a pair of horses, this jig makes short work of cutting studs to identical lengths for framing. A stop block and side guides nailed to a length of two-by-six permit rapid loading and unloading after cutting. Plywood strip on shims guides saw.

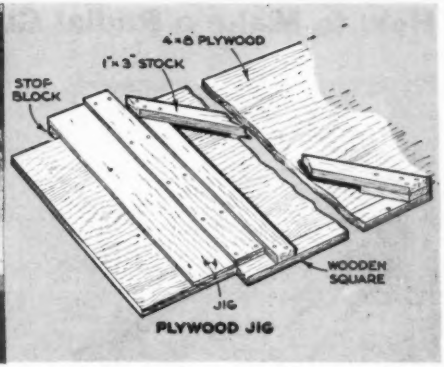
Angle and length of rafter are cut in one setting. This jig is similar to the stud-cutting jig at left above except that plywood guide is set to correspond with pitch of roof. Jig can also be used to establish location of plate notches, which are then cut freehand.

Squaring jig. Held in place with the left hand, a simple jig guides the saw to make square cuts on board ends. The sole of the saw rides on the lower piece of plywood, while the upper half-piece guides it across the work. Cleat, 1" by 4", sets jig square.

Adjustable squaring jig. This jig works on the same principle as the one at left. Its big advantage is that it pivots on a ¼" carriage bolt and can be locked to guide the saw at any angle. Adjustable bevel is used to set jig to desired angle of cut in relation to cleat.

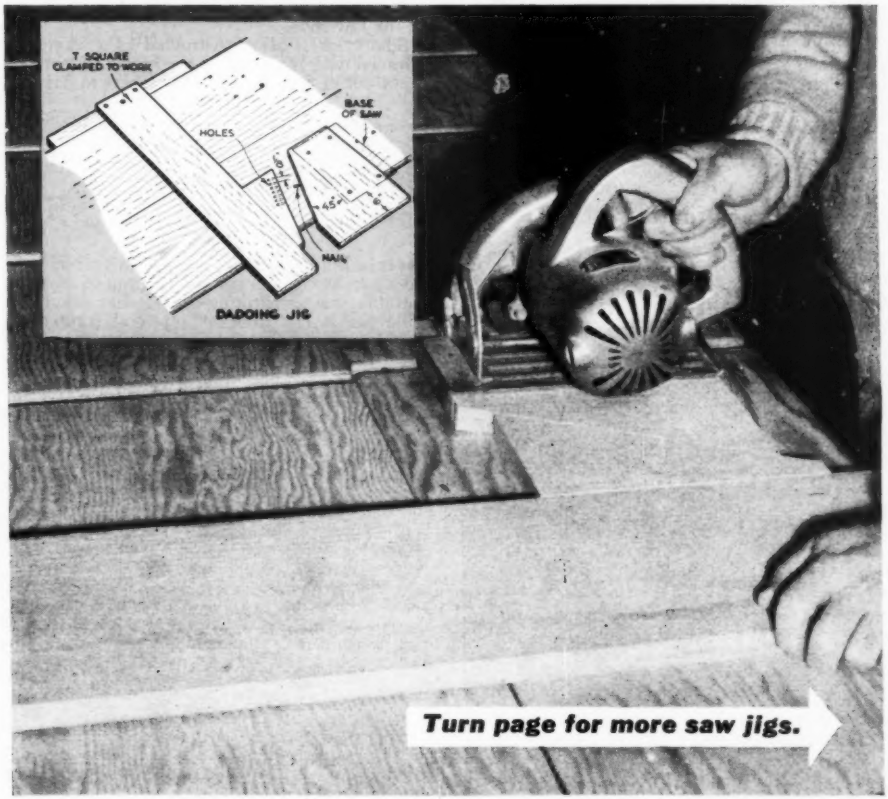






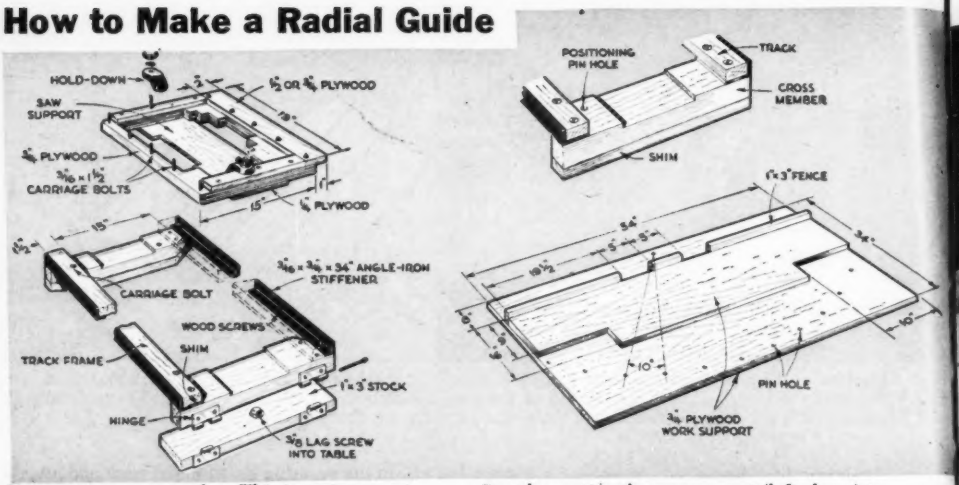
Jig for cutting plywood panels. True cuts can be made in large panels with the aid of the jig above. It is an elongated version of the squaring jig, backed up by an oversize T square. In use (left above) the square is clamped in position and the jig bears against it.

Dadoing jig. Rapid adjustment of a clamped guide fence to make several successive passes when cutting dadoes is impossible. This two-piece guide built by W. G. Waggoner moves the saw one kerf width after each pass. To use, clamp the squaring board to the work and attach saw to large half of two-piece base. After each cut advance the nail to the next hole in the smaller piece. The 45° meeting surfaces of the two parts move saw outward about 1/16".



Turn page for more saw jigs.

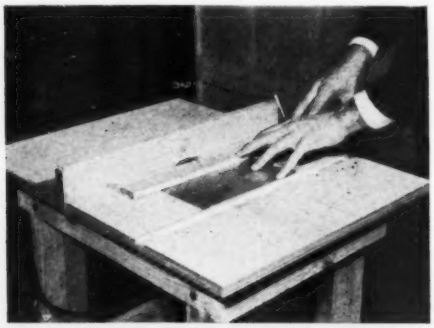
How to Make a Radial Guide

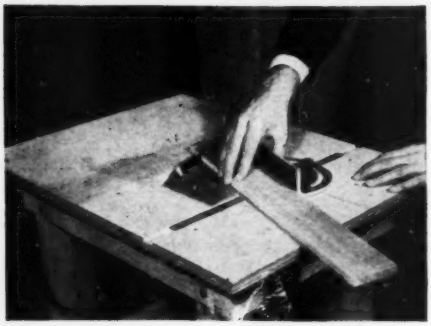


Put your saw on tracks. This is an inexpensive substitute for a radial-arm support, consisting of a pivoted track and sliding carriage. It will handle practically all the cross-cutting, beveling and dadoing operations performed by conventional radial-arm supports, but it cannot be turned parallel with the work for ripping. This is no great handicap, however, as the saw itself, with its ripping guide, does this quite well.

Start by cutting the saw support (left above) to fit your saw, and then fit the support into a frame of ¾" plywood. Mount the two wooden hold-downs on bolts in each end to complete the carriage. Wing nuts lock the hold-downs securely on the saw shoe.

The track is also constructed as a frame reinforced with two strips of angle iron. Clearance is cut out of the track cross members to pass the



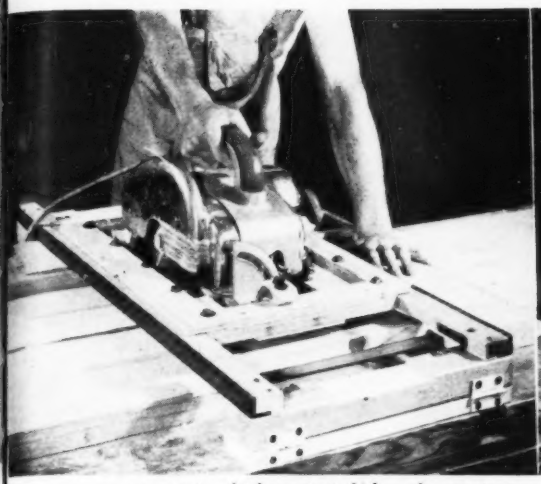


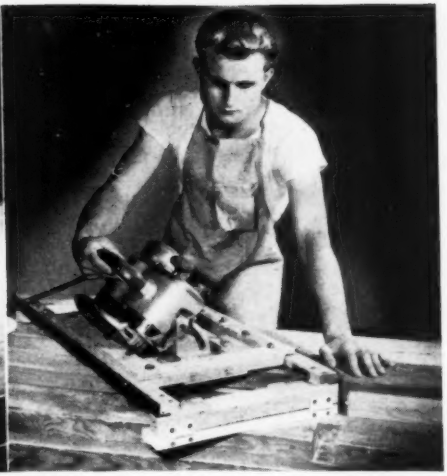
Building a Table for Your Saw

Set it in place for small work. This table, built from two-by-four scraps, enables you to use your portable saw as a tilting-arbor table saw. The table top is cut from ¾" plywood (preferably birch), and rabbeted out in the center to receive the sole of the portable saw in an inverted position. Using a framing square as a guide, draw lines ⅛" apart on the table surface from front to back to aid in setting the rip fence. Cut a groove parallel with these lines for the miter gauge. Coat with shellac or clear lacquer. Use a rubber band to hold the trigger switch on saw in "on" position and plug saw into a receptacle on leg controlled by a separate toggle switch screwed to the table.

The rip fence consists of a piece of hardwood slotted to house the long ¼" clamp rod. A nut soldered on the handle end acts as a shoulder permitting a turn of the rod to pull the bracket on the opposite end tight against the table edge. The miter head is made from a piece of aluminum angle pivoted on a ⅛" by ⅜" aluminum bar of suitable length.

The designer of the table, John Rogers, reports that the depth-of-cut and tilt adjustments on the portable saw permit all the sawing operations possible with a regular table saw, including dadoing and compound mitering, giving the equivalent of two saws for the price of one.

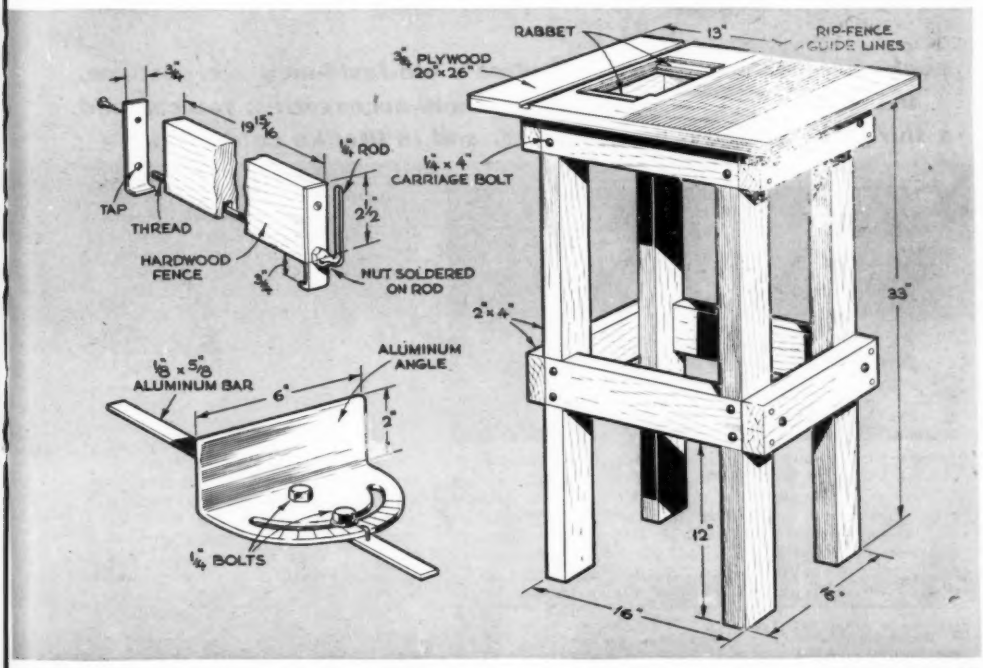




saw support, which projects below the carriage. The track hinges on a 1" by 3" cleat that pivots on a ⅜" lag screw protruding from the radial-guide table.

The radial-guide table makes the outfit complete and portable. It is built up on a base of ¾" plywood. The work support—which may be replaced if cut into too often—is screwed against a 1" by 3" fence. The fence and both ends of the work support are cut away to permit the track to pivot freely. A pivot pin locks the track in square and 45° positions; other holes may be drilled at 10° intervals or as needed.

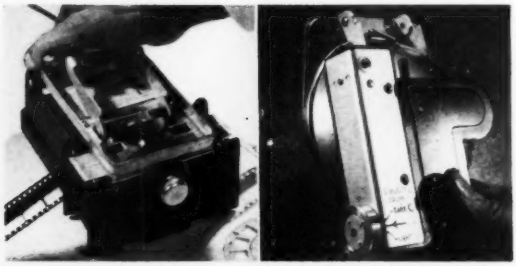
The photo at left above shows a husky portable saw squaring off a board. At right, a compound miter is being cut by tilting the saw blade and setting the track at an angle. Wax the track with paraffin for smooth operation.



New Cameras Popularize Stereo Photos

Half a century ago a stereoscope like the one above was found in nearly every parlor. Modern viewers work the same way but are more compact. Two of the many viewers you now can buy are pictured on these pages—the Stereo-Realist at the left and the Brumberger on the facing page. Both of them have battery-powered viewing lamps that are operated by a switch button.

Look what has happened to Grandma's old-fashioned stereoscope. Using the new cameras, viewers and accessories, you can add a third dimension to your photos, and in lifelike color, too.



Accessories for the new View-Master stereo camera include a cutter for home mounting of stereo pairs. As you cut the pairs, you slip them into slots on opposite sides of a cardboard reel, seven pairs to a reel. Partly cut film shows how View-Master camera first makes exposures along one edge of film, then raises lenses and makes second row of photos while film is turned in opposite direction. Flash unit includes a range finder (above right) that automatically gives correct lens aperture for the distance and color of subject.

Cameras. The Stereo-Realist, the 35-mm. camera that revived interest in stereo pictures, now has some rivals. Like the Realist, the newcomers have f/3.5 lenses and built-in flash synchronization. The Iloca, made in Germany, boasts a self-timer (so the taker can get into picture) and has the fastest shutter speed, 1/300 second. The Busch Verascope, which comes from France, and the Realist and Iloca give you transparencies the width of 35-mm. film, approximately 25 stereo pairs on a normal 36-exposure roll. The View-Master departs from this scheme, takes smaller shots, and you end up with 69 stereo pairs from the same amount of film. After shutter speed has been chosen, turning a dial on top of this camera sets diaphragm to suit the prevailing light condition and subject color.

YOU may still remember the thrill you got that day in Grandma's parlor when you first lifted a stereoscope to your eyes. You gasped—and moved back a step. The scene seemed so real and the precipice so close that you were afraid of falling over.

The principles of stereo viewing haven't changed a bit since Grandma was a girl, but the methods have. Today, you have an increasing choice of equipment—cameras, viewers, projectors and slide-mounting gadgets—to take and show your own stereos in color.

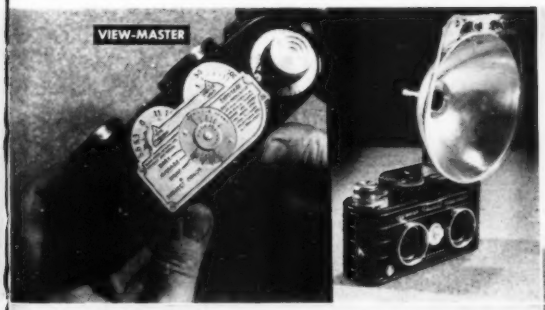
The current popularity of stereophotography began shortly after the war when the David White Sales Co. of Milwaukee introduced the Stereo-Realist camera for taking stereoscopic pairs of pictures.

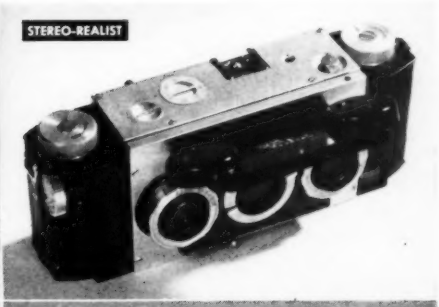
Since then, thousands of amateurs, no longer satisfied with the flatness of normal photos, have put their albums aside and are concentrating on building a file of stereo slides that give a realistic roundness and third dimension to the subjects. Business men use stereo to demonstrate a product or manufacturing process.

As a hobby, stereophotography still is expensive, but new cameras now being planned may bring prices down. A camera made by Sawyer's Inc., Portland, Ore., cuts film costs by cramming more pairs on a single roll. Seven pairs of pictures are mounted on a cardboard disk. To view them, you insert the disk in a special viewer and then revolve it.

For an explanation of how stereo works see the next two pages.

Metal binders (left) are sold for home mounting of slides. A chart supplied with the binders shows where to cut matched transparencies. Prongs align transparencies, and the halves of binder snap together, sandwiching pictures between glass.

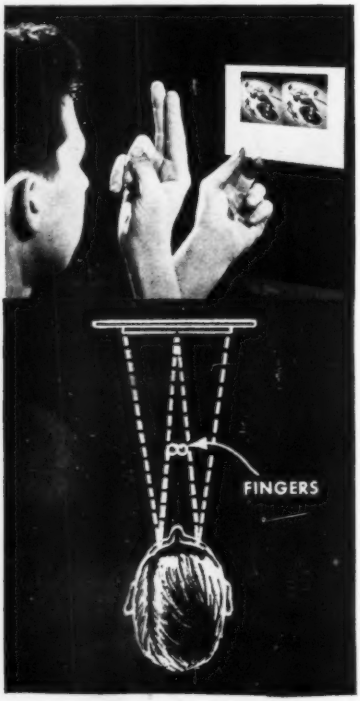




Stereo Fools Your Eyes

You don't need a special viewer to see the pictures above in full third dimension. Here's how to do it.

By Kenneth M. Swezey
Author of Science Magic



LIKE the new Cinerama movies, stereo photos draw you into the picture. An illusion of depth creates the impression that you are right in the middle of what you are seeing.

Cinerama works its tricks by a combination of multiple projectors on a curved screen, but stereo still pictures achieve a third dimension on principles as old as man. In fact, they imitate a trick that your eyes play on you. A pair of pictures usually are taken simultaneously by a camera that has two lenses spaced 2½" apart—about the same as your eyes. When you look at these slightly dissimilar pictures in a viewer, each eye sees only the view taken by the corresponding camera lens. Your brain fuses the two pictures into one.

To see stereo pictures in the third dimension you must relax your eyes so they are directed straight ahead. The lenses in the ordinary viewer help you do this. But with a little practice you can see a stereo pair in three dimensions without a viewer.

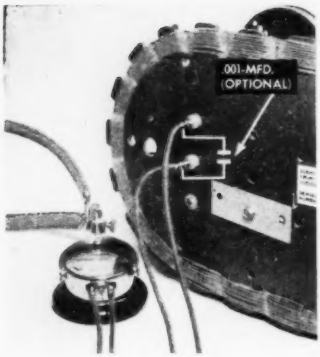
Hold two fingers between your eyes and the stereo pair at the top of the page as shown at the left. Place your fingers so that your left eye can't see the right photo and the right can't see the left. If you can now relax your eyes, the pictures will merge.

Eventually you may be able to do this without using your fingers. Look over the top of this page at a distant object. Then, without changing your eyes, lower them to the photos. If you succeed, you will see *three* pictures—a three-dimensional one in the center, two flat ones on each side.

Everybody's cross-eyed in looking at close objects. This is a point you must remember to understand stereoscopic vision. If you look at an object more than a quarter-mile away, your eyes point straight ahead. But the closer you get, the more they converge. To see this, have a friend hold a pencil at arm's length and look at it steadily while pulling it back to his nose. Because of this convergence of vision you see things in three dimensions and are able to judge distance. Your eyes see two different views of an object. Your brain combines the two images into one that seems to have depth. A stereo viewer gives the same result when you look at a stereo pair.

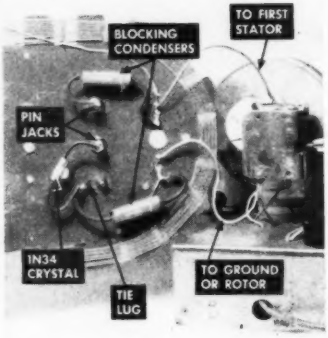
Judging distance with one eye is difficult because you see everything in only two dimensions—height and width. Try it and see. Have a friend hold a pencil upright. Then close one eye and, with your arm outstretched, walk toward him and try with one stab to touch the pencil from the side. If you are able to judge the distance within an inch you are better than average. Next, to see what two eyes do for you, try the same trick with both eyes open.

You can take stereo pictures of stationary objects with an ordinary small camera. If you object to making gadgets, just mount the camera on a tripod, take one picture, and carefully move the camera 2½" to one side and take another. The stereos on the facing page were shot this way. A wood tray like that in the sketch will make shifting the camera easier. Make contact prints of the two pictures and mount them on cardboard in the sequence they were taken. Space them so that similar points on the nearest object in the two pictures are 2½" apart. This measuring will show another difference in stereo pairs. Similar points on distant objects will be greater than 2½" apart.



LOCALS COME IN with good volume on earphones, though with poor selectivity as compared to the tube circuit. Be sure to connect .001 condenser across phone tips, not jacks.

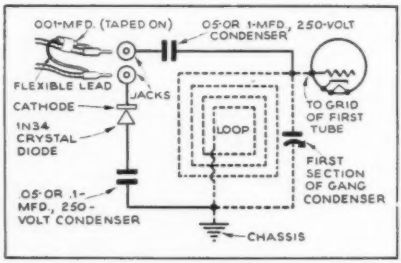
LOOP IS GOOD PLACE for mounting crystal-circuit parts. If the set has no loop, they can go on rear of chassis. With phones disconnected, tube reception is unaffected.



Emergency Crystal Runs Regular Radio if House Power Fails

About a buck's worth of radio hardware adds an emergency crystal circuit to any tube radio. With it, you can get local stations on earphones even when the power line goes dead or a tube burns out on you.

If you fall asleep listening to a late program, it doesn't matter, for the crystal takes no juice and the power switch is off while it works.

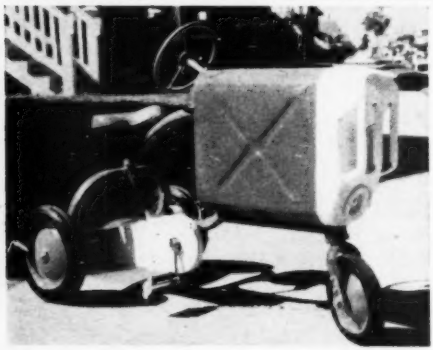


A germanium-diode crystal across the first tuned circuit does the trick. If the chassis is hot (one to which the power line is grounded), insulate the crystal circuit with two .05- or .1-mfd., 250-volt blocking condensers as shown. If the set has a power transformer to which the line cord runs, the chassis is not hot and the condensers can be omitted from the crystal emergency circuit.

Connect the diode to the chassis end of the loop (the line cord acts as antenna for the crystal circuit). If your radio has an RF coil instead of a loop, hook the circuit to the first stator of the tuning condenser and ground, trying the two leads both ways to see which works best.

A .001-mfd. condenser across the phones is optional but improves reception. To use the crystal, leave the line cord plugged in but the power switch turned off. Tune in with the regular tuning knob. If you get a hum, reverse the power plug. Disconnect the phones when using the tube radio.—*Arthur Trauffer, Council Bluffs, Iowa.*

GI Gas Can Converted to a Realistic Toy Tractor for Youngster



Capt. Francis J. Conway of Fort Myer, Va., turned a surplus gas tank into a very workable tractor for his son.

The tank, artfully welded to the rear section of a broken chain-drive tricycle, forms a realistic hood and radiator for the toy tractor. The steering wheel was built up by bending ¼" cold-rolled rod into a circle and welding the ends. Three spokes were then welded to a length of 9/16" pipe which was linked to the front steering fork through a ½"-drive socket-set universal. The gas filler hole provides access to the universal for installation and oiling.

Hobbyhorse Runs on 1/10th Horsepower

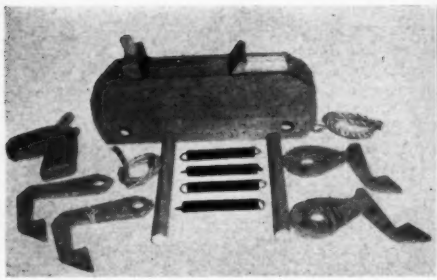
Traditional Christmas toy is the hobbyhorse. You've still time to get this one under your tree.

By John Rogers

ALL kids love a hobbyhorse, but a hobbyhorse that is motorized is really something special. Tired of feeding money (and that ain't hay) to the coin-operated hobbyhorses that have appeared in the local department stores, I went to work on some scrap lumber and built this mechanical Man O' War.

Body. This was made hollow by gluing ¾" shelving over a three-sided frame of two-by-fours. Blocks were glued on top for carving the saddle. Lengths of 1⅜"-diameter clothes pole 18" long were glued into holes in the sides at front and rear for the springs.

Head and legs. The head was cut from a piece of 2" by 8" pine, with all edges except the one joining the body rounded. Two



PARTS cut from scrap lumber and pieces of plywood make legs, head and body of horse. The 1″-diameter springs were shortened to about 4″ for proper tension.

WOOD RASP was used to shape body and saddle, but roughing out can be done with chisel. Outline of saddle skirt is made by cutting V groove with sharp-pointed knife or chisel.

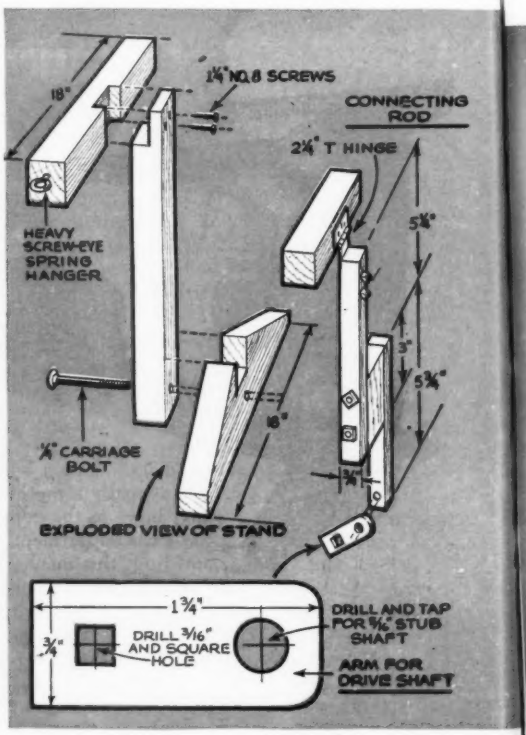
¼″ plywood tabs were used for ears. The legs were cut from scraps of ¾″ plywood and drilled to fit over the spring-hanger poles.

Stand. This was sturdily constructed from lengths of two-by-four joined with ¼″ carriage bolts. Heavy screw eyes on the stand and at the ends of the spring hangers connect the 1″-diameter springs to support the horse.

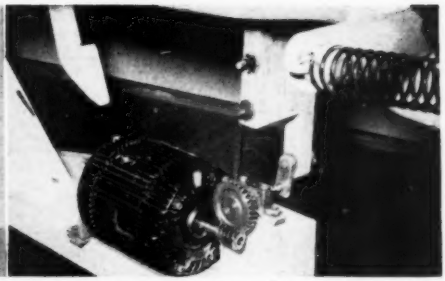
Motor and gearing. A 1/10-hp. motor was ample for the simple up-and-down motion. I selected the gears from the catalogue of the Boston Gear Works (Quincy 71, Mass.) to effect a 15-to-1 reduction in the 1,500-r.p.m. motor speed. The worm on the motor shaft (Boston No. HDVH) turns the worm gear (No. D1143) on a 5/16″ drill-rod shaft. This shaft is supported by a pillow-block bearing (No. PPB6) set on a wood block of suitable height to bring the gears in mesh.

Eccentric arm and con rod. The eccentric arm was cut from a length of ¼″ by ¾″ mild steel. One hole was drilled and filed square to fit the squared-off end of the worm-gear shaft. The other hole was drilled

STAND was made sturdy to support weight of child and horse in action. Glue, screws and ¼″ carriage bolts hold it together. Screw eyes at ends of T member are for suspension springs. Corner braces keep ends vertical.



HORSE'S HEAD, cut from 2″ by 8″ pine, was drilled for hemp-rope mane. After horse was painted, rope was glued into holes and unraveled. Ears are plywood tabs.

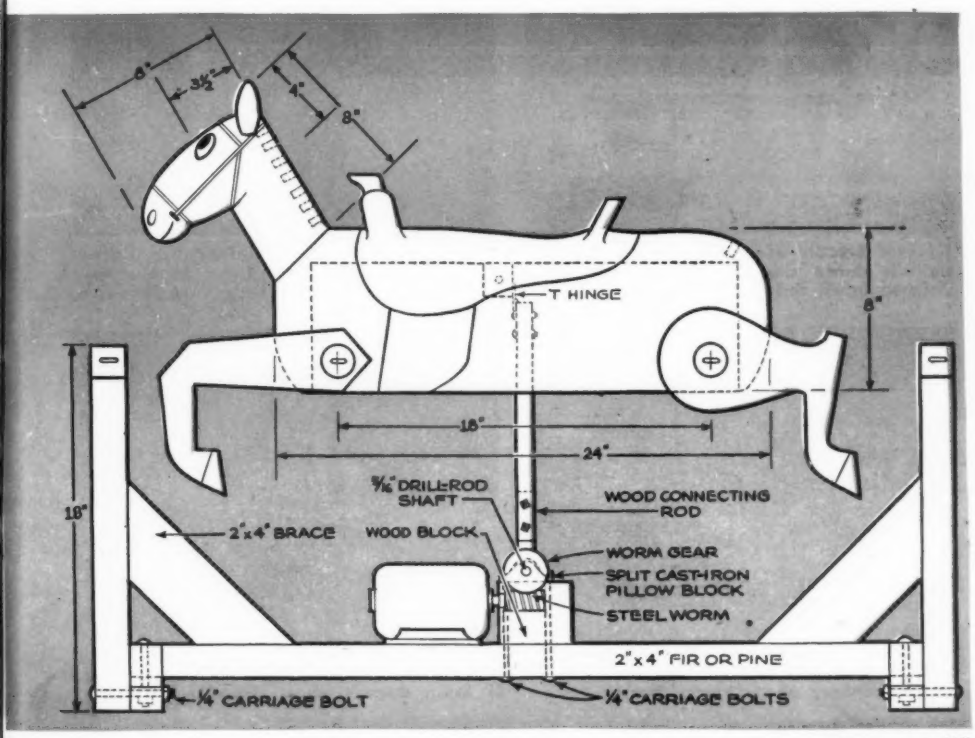


GEAR REDUCTION (15 to 1) reduces 1,500 r.p.m. at motor to 100 r.p.m. at the eccentric arm. If your motor runs faster, use a greater reduction. Wire-mesh guard is not shown.

and tapped for a 5/16″ stub shaft to drive the connecting rod.

The wooden connecting rod was fitted with a 5/16″-inside-diameter bronze bushing to ride easily on the eccentric-arm stub shaft. A cotter pin inserted in a hole in the shaft holds the assembly together. The upper end of the con rod was screwed to a T hinge mounted on a wood block up inside the horse's body. Although it was removed for the pictures, a hardware-cloth guard installed over the gears protects the fingers of the little equestrian.

Finishing up. I applied flat white paint to the stand and wiped it off to give a limed effect. The horse was enameled white. The saddle was painted burgundy, the eyes and mouth blue, the bridle black. END



How to

Tame Balky Flashlights

You needn't throw away a flashlight that doesn't work. Probably all it needs is a simple fix-it job.

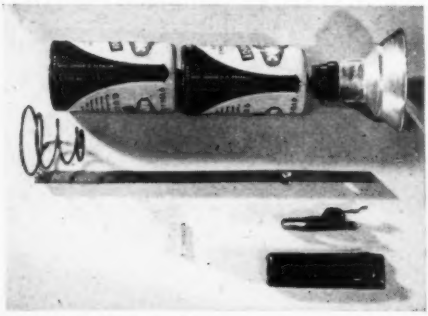
BREATHES there a flashlight with soul so dead it has never acted up on you? Favorite tricks of these miscreant flashlights are: 1. total darkness, even with good cells and bulb; 2. a tendency to give off light like a tired glowworm; 3. a willingness to work only when held at a 22° angle or when given two smart raps in the full of the moon.

Fortunately these sly tricks can be disciplined with the repair dodges shown in the photos. Your first step is to determine if the flashlight has an electrical switch or a mechanical switch. In the latter case, a metal strip is moved forward until it rams the side of the reflector cone.

A defective electrical switch can be removed by drilling or chiseling out the holding rivets. When the time comes to replace it, a vise-held piece of pipe will make an anvil to rivet against.

If the trouble seems to center in a mechanical switch, check first to be sure the reflector cone is electrically separated from a metal case.

Servicing a water- or explosion-proof flashlight should also include inspection of the gaskets. If a light has a defective gasket or cracked lens, don't use it in a gasoline-vapor or other explosive atmosphere.—*Ken Murray, Colon, Mich.*

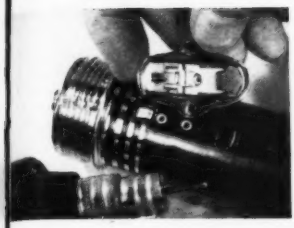


ELECTRIC CIRCUIT of common type of flashlight is shown above. Button moves metal strip to touch reflector shell, lighting bulb.

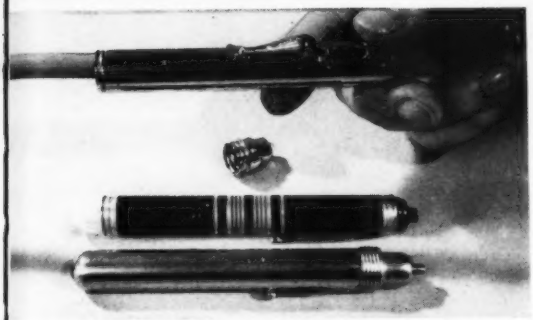
BULB AND BATTERIES should be tested first. With circuit bridged, 2.4-volt bulb should glow. If not, bulb or battery is defective.

CAP SPRING, outside of bulb reflector and end of brass contact strip can be cleaned with sandpaper or an emery board.

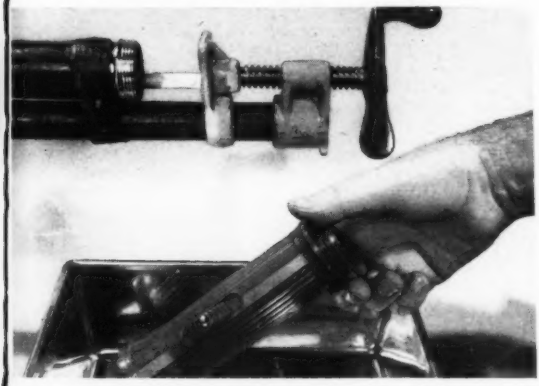
ALLIGATOR CLIPS on each end of circuit can test electrical-type switch in on position. If lamp doesn't glow, switch is defective.



ELECTRICAL-TYPE SWITCH usually is a simple sliding contact spring. If spring is broken, cut another from thin spring brass.



PENLIGHT contacts can be cleaned with disk of sandpaper glued to end of dowel, removing corrosion that causes flickering of bulb.

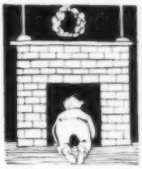


STUCK CELLS can be removed (top) by taping case to bar clamp. Then stick, pushed by clamp screw, shoves cells out. In plastic case, stuck batteries can be loosened by soaking case in solution of two parts ammonia and one part water.

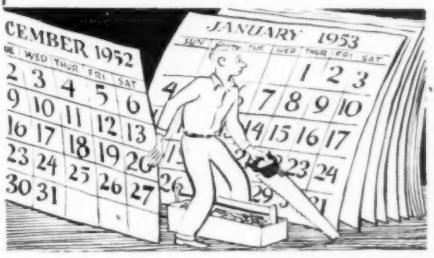
SCRATCHES can be removed from plastic lens by rubbing with cream made of water and tooth powder or toothpaste.

December brings the first official day of winter, along with the most joyous holidays of the year. Have a very merry Christmas, but don't neglect the extra precautions of fire protection needed this month.

- Indoor heat will dry your Christmas tree to tinder, so first make it fire-resistant (see page 194), and inspect the tree lights with special care. And just to be sure, keep a recently charged fire extinguisher nearby.
- Check the fireplace and flue before burning the Yule log. Repair loose mortar, cracked brick or a defective damper. Flues should be cleaned every three to five years—more often if you burn softwood. Be careful burning wrappings and wreaths; they often start chimney fires.



- Relax and think of the months ahead. If fall preparations for winter were completed, there'll be little to do now except shovel snow and watch the gutters for ice dams. Also keep an eye out for ice-laden branches near the power and phone lines.
- Remember, the Home Handyman's Calendar is good any year, all year.

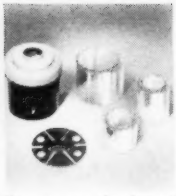


Easy-to-use materials for printing pictures—ideally suited for beginners. **Kodacraft Printing Kit, $4.95.**

Basic essentials for developing and printing pictures, including roll-film tank. **Kodacraft Photo-Lab Outfit, $8.75.**

Complete developing, printing equipment, incl. metal printer. **Kodacraft Advanced Photo-Lab, $14.10.**

For efficient print drying. Counteracts tendency of prints to curl. Use it over and over. **Kodak Blotter Roll, $2.88.**



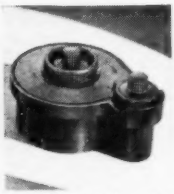
Easy to use, load, and pour. Takes 620-120, 616-116, and 127 roll films. **Kodacraft Roll-Film Tank, $2.53.**

For simultaneous development of two rolls of 828 or 135 film. **Kodacraft Miniature Roll-Film Tank, $2.53.**

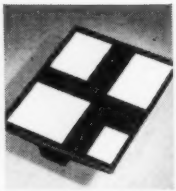
Save time—Shop here

for the photo fans on your Christmas list

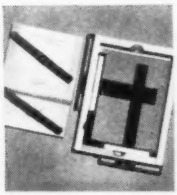
These two pages give you some idea of the many useful and inexpensive gift ideas at your photo dealer's. Visit him soon. He'll be glad to help you choose just the right gift for every photo fan on your shopping list.



Permits loading and processing of 35mm. films to be carried out in daylight. **Kodak Day-Load Tank, $9.30.**



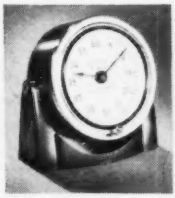
New-type printing frame of steel construction. Includes a set of masks. **Kodacraft Printing Frame, $1.29.**



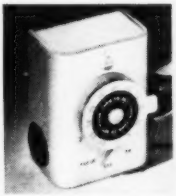
Adjustable—accepts all sizes of negatives up to 4 x 5½ inches. **Kodak Auto-Mask Printing Frame, $2.79.**

Converts ordinary tray to efficient, trouble-free washer for prints or films. **Kodak Automatic Tray Siphon, $4.50.**

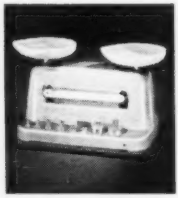
Frees both hands for handling equipment and material in the darkroom. **Kodak Utility Footswitch, $10.00.**



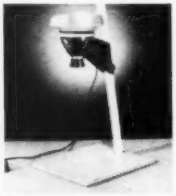
Tilting base, minute and split-second hands, large dial. Covers intervals to 60 minutes. **Kodak Timer, $7.20.**

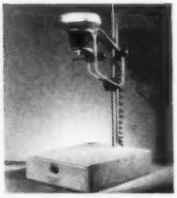


Gives precise timing in contact and projection printing, 1 to 57 seconds. **Kodak Electric Time Control, $13.50.**

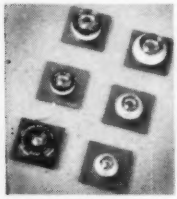


Handsome chemical-resistant plastic housing protects all working parts. **Kodak Chemical Scales, $9.90.**

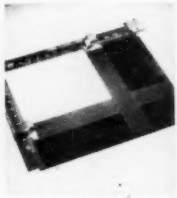




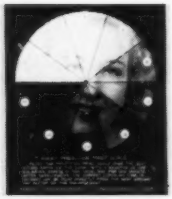
Cool, Circline fluorescent lamp, integrating-sphere lamphouse are prominent features in each enlarger. **Kodak Hobbyist Enlarger** *(left)*, $44.00, complete with f/6.3 lens. Versatile **Kodak Flurolite Enlarger** *(right)*, $99.50, without lens.



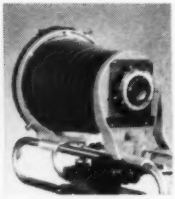
Lenses for the Flurolite Enlarger range from 50mm. f/4.5 "Ektanon" to 4-inch f/4.5 "Ektar." From $14.00.



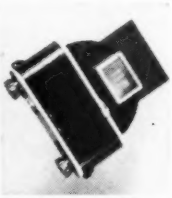
For accurate masking of enlargements—use it with any vertical enlarger. **Kodak Masking Easel, 11 x 14, $9.60.**



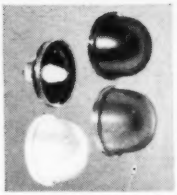
For determining correct printing time—saves both paper and time. **Kodak Projection Print Scale, $1.15.**



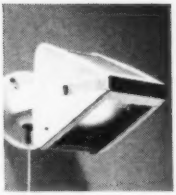
Feature-packed view-type camera—permits one-to-one close-ups. **Kodak Flurolite Camera Combination, $60.00.**



Permits use of 35mm. film with Flurolite Enlarger or Recomar-type cameras. **Kodak 35mm. Film Adapter A, $45.00.**



Includes three cups for darkroom work with both papers and films. **Brownie Darkroom Lamp Kit, $1.75.**

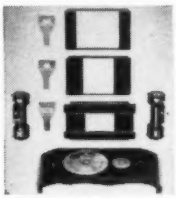


New darkroom safelight that provides direct or indirect illumination—or both. **Kodak 2-Way Safelamp, $4.50.**

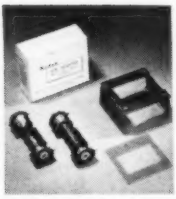
Can be used either from a drop cord or in a wall plug. Includes safelight filter. **Kodak Darkroom Lamp, $4.70.**

Attaches to wall, shelf, bench. Includes switch, cord, safelight filter. **Kodak Adjustable Safelight Lamp, $7.40.**

Expertly made, offers sound protection together with smart appearance. **Kodak carrying case.** From $2.65.



Adapts de luxe model Kodak Tourist Cameras to take Kodachrome Film. **Kodak Tourist Adapter Kit, $13.25.**



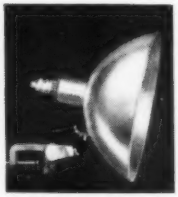
Permits use of economical Bantam-size (828) color films. **Kodak 828 Adapter for Kodak Reflex Cameras, $4.59.**

Automatically trips shutter, permits photographer to get into picture. **Kodak Auto-Release, $3.86.**

Provides dependable "flash" for most internally synchronized cameras. **Kodak Standard Flasholder, $8.25.**

Sensational new battery-condenser flash system. **Kodak Ektalux Flasholder** (Standard Bracket), $29.75.

Condenser-type power for dependable "flash." **Kodak B-C Flashpack,** $2.95 (without 22½-volt battery).



Twelve-inch reflector focuses readily from wide to narrow light beam. **Kodak Vari-Beam Clamplight, $10.50.**

Permits close-range picture taking with most fixed-focus cameras. **Kodak Close-up Attachment, $1.63.**

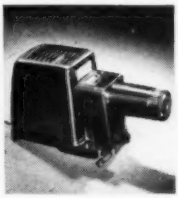
Now a filter designed for inexpensive box cameras—emphasizes clouds. **Kodak Cloud Filter, $1.72.**

Provides an excellent means of darkening the sky and clouds in color pictures. **Kodak Pola-Screen, $6.75.**

Shades the camera lens and reduces sky flare—attaches directly to adapter ring. **Kodak Lens Hood.** From $1.65.

Popular yellow (K2), red (A), and green (X1) filters to fit most cameras. **Kodak Wratten Filters.** From $1.65.

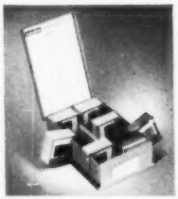
Two compartments hold 4 filters, adapter ring, lens hood. **Kodak Combination Filter Cases,** $4.25, $4.95.



New-type slide-feeding mechanism, cool operation, elevating device. **Kodaslide Merit Projector, $26.10.**

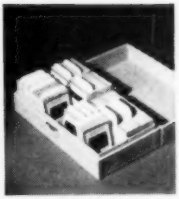
2 x 2 projector and screen in a single unit. Usable in fully lighted room. **Kodaslide Table Viewer, 4X, $49.50.**

Projector, screen, slide changer in one unit. **Kodaslide Table Viewer, Model A, $97.50.**



Compartments for 240 cardboard or 96 glass slides. **Kodaslide Compartment File, $3.94.**

Protects 140 cardboard or 55 glass slides—keeps them organized. **Kodaslide File Box, $1.57.**



Holds 360 2 x 2-inch or 160 stereo slides. **Kodaslide Flexo File, $1.25.**

Prices subject to change without notice and include Federal, Tax where applicable. Consult your dealer.

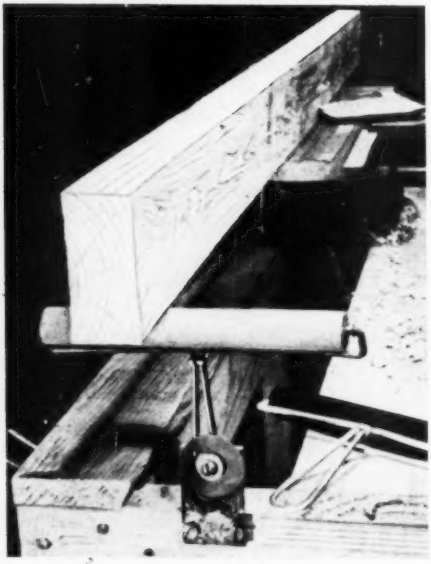
EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

Kodak
TRADE-MARK

Curtain for Big Picture Window Hung on Surplus Aircraft Cable

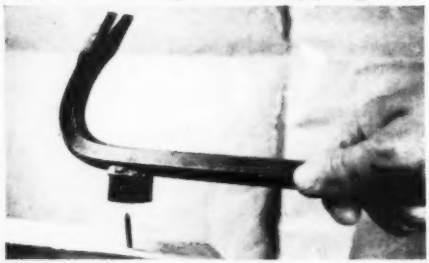
WIDE curtains—for a picture window, a wall or a row of windows on a sun porch—can be hung conveniently on a taut steel cable. The cable I used was aircraft control cable that I bought at a surplus store. A big screw hook and a cable connector, as shown in photo at right above, hold the cable to the wall at one end. A turnbuckle at the other end lets you tighten the cable. If the curtain covers a big wall, you may have to put another hook in the center as a support. With the cable in place, hang the curtain with standard hooks.—*Darrell Huff, Sonoma, Calif.*

Roller Is Jointer Support



AN OUTBOARD support for a jointer or a circular saw can be made with a photo-print roller. Line up the roller with the rear table of the jointer or the table of the saw. Use an accurate straightedge for this job.—*Harry L. Truchelut, Atlanta, Ga.*

Steel Pad Improves Ripping Bar



HAVE a piece of cold-rolled steel 1¼" in diameter and ¾" thick welded to your ripping bar. Then the bar will serve as a hammer to back out nails until the head can be grabbed with the claw.—*Earl R. Nearhood, Colorado Springs, Colo.*

Grommet Separates Keys

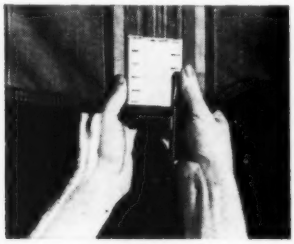
FOR fast location of that much-used key among others on a chain, use a small rubber grommet. The grommet keeps the key spaced from the others and makes identification easy even in the dark.—*Andrew Brennan, Philadelphia.*

FASTEN IT FASTER

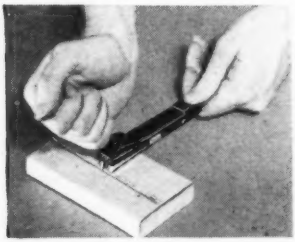
PLASTIC SCREENING can be tacked to frames quickly and easily with *Bostitch B-8* used as tacker.

PUT WRAPS on your paint brushes between jobs. *Bostitch B-8* has removable base for getting into tight places.

STOP HEAT LOSS by covering warm air ducts with asbestos paper. *Bostitch B-8* makes it an easy, one-night project.



TORN CANVAS on awnings or furniture can be mended by stapling parts with *Bostitch B-8.*



SANDING BLOCKS are easy to make when you tack sandpaper to blocks of scrap lumber with *Bostitch B-8.*

KEEP PATTERNS IN PLACE by stapling them to material to be cut. Lift them easily with *Bostitch B-8's* staple remover.

$2.85
Slightly higher in the West and Canada

IT'S A STAPLER!
IT'S A TACKER!
IT'S A STAPLING PLIER!
IT'S A STAPLE REMOVER!

Bostitch gives you the only fasteners with staple remover attached.

with the *Bostitch B-8*
WITH REMOVER

The Bostitch B-8 is one of 800 Bostitch staplers and stitchers made for home, office and industrial use. For help in solving production line or shipping room fastening problems, write: BOSTITCH, 532 Mechanic St., Westerly, R.I.

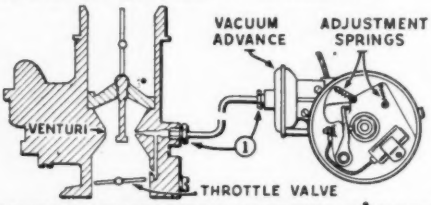
BOSTITCH®
fastens it better, AND FASTER with wire

Care and Feeding of Engines

BY S. P. CORP

POOR TIMING WASTES GAS

Your ignition distributor interrupts the primary circuit for correct timing of the spark, advancing the timing as your engine accelerates. A *vacuum distributor advance* connected to the distributor governs timing for sudden loads on the engine, such as fast acceleration.



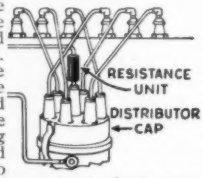
VACUUM DISTRIBUTOR ADVANCE HOOK-UP

A small pipe line connects this vacuum advance to the carburetor, which furnishes the vacuum. Should this line become clogged, poor engine performance and low gas mileage can result. An engine may backfire and fill this line with gasoline, which would clog it.

To correct, loosen nuts at each end of pipe marked (1), remove pipe from fittings, and blow it clear. *Caution:* When replacing, turn nuts halfway by hand before using a wrench, as threads are very fine and can be crossed, causing an air leak. It is a good idea to have the vacuum advance unit checked for diaphragm leaks, to protect gas economy.

ONE CAUSE OF HARD STARTING

Your car radio uses a resistance unit to remove ignition interference. This is installed in the high tension lead from ignition coil to the center of the distributor cap. Being a carbon resistance unit, its resistance increases with age and heat from the engine.



Such increased resistance interferes with current to the spark plugs and can cause hard starting, also a high speed miss. As a rule, the correct resistance is marked on the outside of the unit. It can be removed and checked by any radio service man. Remove it by pulling the wires out of each end and placing the coil wire back into the distributor cap. With unit removed, check starting of engine. If trouble is corrected, get a new unit. Car radios require such a unit for good operation.

GET VALUABLE BOOKLET FREE

"MORE POWER, Less Gas, Less Oil," a new booklet on car care, is yours for the asking. It tells about new Sealed Power KromeX Ring Sets. Write Sealed Power, Dept. H-12, Muskegon, Mich.

Gus Rescues Ten Little Angels

[*Continued from page 182*]

He dismantled the carburetor filter and found dirt inside, but not enough to clog the works. The red, powdery deposit in the bottom was dry. Gus asked Wingate to turn the engine over.

When the other man pressed the starter button, the engine cranked over, but no gas came through.

"Okay, that's enough."

The fuel pump was the next suspect, and it wasn't a nice thought. If the pump needed a new diaphragm. . .

Wingate got out of the car again. "How's it coming?"

"I haven't found a thing yet."

Wingate shivered in the wind and held the flashlight while Gus inspected the pump. The line was dry.

Gus Gets His First Clue

"You sure you've got enough gas?"

"First thing I checked."

"Did you notice anything strange about the way the car was running?"

"No. Before she quit, she was ticking away like a Swiss watch. . . Wait, I do remember something, only it didn't happen this evening. A couple weeks ago, the car started conking out near the top of a hill, about like this one, but I managed to make the top and she picked up again. It hasn't happened since. Or at least until now."

"That could mean almost anything. I'll go over the fuel line, and if I don't find anything, I'd better go after help."

The station-wagon door opened again when Gus crawled under, and Lydia Randolph spoke over a child's sobbing.

"Perry—any hope of getting on soon? Little Judy's crying. I'm afraid it may start the others to crying, too."

"Mr. Wilson's doing his best. I think we'll be on our way in a few minutes now."

Kids' Patience Begins to Wear Thin

As Lydia opened the door to get back in, the little girl jumped out, and Wingate threw his coat around her.

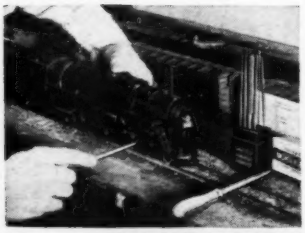
"Judy, listen to me. You don't think Santa Claus is going to let you miss the chance to lead the choir, do you? Of course not. And little girls who cry get their voices all wet and rusty. Now you climb back in there and keep an eye on the other kids. We'll be starting for the church pretty soon."

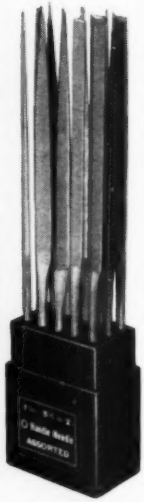
[*Continued on page 234*]

WHAT? YOU INSULATED YOUR HOUSE YOURSELF?
SURE-WITH GOLD BOND ROCK WOOL BLANKETS-AND WHAT A DIFFERENCE!
WITHOUT INSULATION THE FURNACE HEAT WAS GOING RIGHT UP THROUGH THE ROOF.
SO I PUT FIREPROOF GOLD BOND ROCK WOOL BLANKETS IN THE ATTIC. IT SURE WAS EASY!
Gold Bond
IN THE UNFINISHED PART, I JUST LAID THE BLANKETS WITH THE VAPOR BARRIER DOWN!
IN THE WALLS AND CEILING OF OUR ROOM I USED 8 FOOT BLANKETS LIKE THIS- IT WAS A CINCH.
MY GOLD BOND LUMBER AND BUILDING MATERIAL DEALER FIGURED THE WHOLE JOB - SHOWED ME EXACTLY HOW TO DO IT...
BUILD BETTER WITH
Gold Bond
BUILDING PRODUCTS
EVEN SUPPLIED A STAPLING GUN- (NAILING IS EASY, TOO!)
MY FUEL SAVINGS HAVE MORE THAN PAID THE COST. THE WHOLE HOUSE IS WARMER IN WINTER AND MUCH COOLER IN SUMMER! WHY DON'T YOU SEE YOUR GOLD BOND DEALER ABOUT INSULATING NOW!
LOOK FOR THE STRIPED PACKAGE
Gold Bond
ROCK WOOL SEALED BLANKETS
ADD-A-ROOM NOW!
with Gold Bond
BUILDING PRODUCTS
NATIONAL GYPSUM CO.
BUFFALO 2, N. Y.

X.F. for Xmas

GIVE THIS KIT OF SUPERB NEEDLE FILES





Here's an ideal and most practical gift for amateur or professional craftsman—or perhaps for yourself. Indispensable for those final touches that bring triumph to a delicate fit or successful operation to a critical moving part. Accurately made of high-quality steel, Nicholson X.F. (*Extra-Fine*) Swiss Pattern Needle Files come in twelve assorted shapes; in popular lengths and a choice of cuts . . . all in a handsome blue-and-orange plastic case with bottom stand. *Sold by good hardware stores.*

FREE BOOK, "*File Filosophy*," tells much about filing with Swiss Pattern and other files . . . in 48 interesting illustrated pages. Send for it.

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(In Canada, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*

Gus Rescues Ten Little Angels

[*Continued from page 232*]

"All right, Mr. Wingate," Judy sobbed.

Gus heard the door slam, then Wingate was back with the light. "I guess you heard—Judy was counting on leading the choir."

Gus bit his lip and followed the fuel line down the frame, trying to ignore the cold.

"Move that light a little to the left."

Gus grunted his disappointment and started to crawl out. Then he stopped and asked for the light again.

Gus Hits Pay Dirt at Last

He took the flash from Wingate and ran it along the line, remembering what Wingate had said about it happening before, on a hill, like the one they were stalled on now. Gus stared at the wooden bed piece above the frame. What might happen on a hill?

Gus inserted a screwdriver between the fuel line and the bed piece where the two ran together. A little pressure warped it away from its original position. He ran a finger over the exposed side of the line, but found nothing. He moved the screwdriver down a few inches and tried again. This time he hit pay dirt!

"Now Mr. Wingate, if you'll get that friction tape from my glove compartment, you'll find your worries over with!"

"No kidding! Okay, hold on."

A moment later, Gus had the line taped securely, and he crawled out.

"Start it up, and turn on the heater for those kids."

The engine cranked for quite a while, but finally gas pumped through, and she caught hold.

When Driver Shifts, Body Shifts

"This is only a temporary repair. Better put a new fuel line in as soon as you can. What happened was, the line had a hole worn into it by a sharp edge of the wooden bed piece. You see, your station wagon is old, and the body has loosened up to where every time you go up a steep hill and shift into lower gear, the body slips back a little. Gradually, the copper tubing wore through at that point. This evening—and probably that other time you mentioned—when you started up the hill the body shifted enough to make the sharp piece of wood slide off the hole. So your engine ran only long enough to exhaust the fuel in your carburetor and pump and what little was left

[*Continued on page 236*]

YOU CAN MAKE SHOPSMITH

Pay for itself

ON A REMODELING JOB LIKE THIS

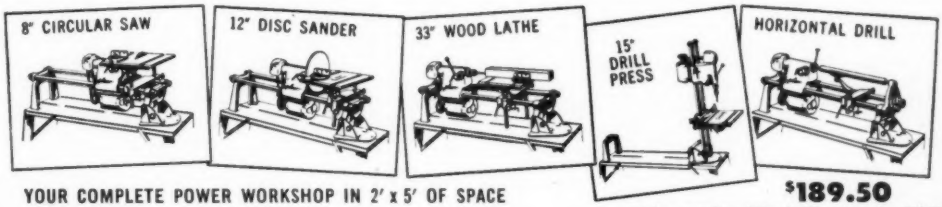
Photograph by the makers of Armstrong Asphalt Tile

Take a closer look at this attractive basement shop. Notice the fine workmanship . . . the beautifully fitted drawers and doors . . . the accurately mitered shelf joints . . . the expertly paneled walls.

Notice the SHOPSMITH, too! For this is the versatile power tool that makes it possible for *you* to do remodeling jobs like this! SHOPSMITH'S high precision accuracy and its simplicity of operation make it easy to turn out work of exceptional quality. And, in addition to the fun of doing it yourself, you can save $200-$350 on a project such as this—more than enough to pay for your SHOPSMITH.

You can do more jobs with SHOPSMITH—in less space—than with any setup of individual tools. Furthermore, in each of its five basic positions, SHOPSMITH exceeds most individual tools in accuracy, capacity, quality!

To prove all this to your own satisfaction, just see SHOPSMITH demonstrated and *compare* —at leading hardware and department stores or any Montgomery Ward store!



YOUR COMPLETE POWER WORKSHOP IN 2' x 5' OF SPACE

$189.50

½-hp., capacitor, 120-volt, 60-cycle motor, $34.50

SHOP SMITH

MAGNA ENGINEERING CORPORATION
Dept. 223-A
at factory nearest you
12819 Coit Road, Cleveland 8, Ohio, OR
Menlo Park, Calif.

Please send me a free copy of the SHOPSMITH catalog and the name of my nearest SHOPSMITH dealer.

Name _____

Address _____

City _____ *State* _____

A Man's Gift!

For that man among men who works with his hands. He's always wanted power tools, but he's been too unselfish to buy them for himself. Give him a PET Power Tool for Christmas!

Mirror finished ¼" drill Pistol grip, trigger switch, lock with instant release. Model 1950-HM. In gift box, **$19.95**

Gold-tone finished **¼" drill.** This will make him whistle! Tops in looks and performance. Model 1950-HB. In gift box, **$20.95**

Chromium and satin finished **¼" drill.** High quality, yet low in price Pistol grip, trigger lock Model 77-HC. In gift box, **$14.95**

High-luster finished **Zip-Sawer Jr.** Converts any ¼" drill into a portable saw. Rips, cross-cuts, trims. Model ZP-1. In gift box, **$7.95**

35-pc. attachment set. Fits any ¼" drill. Sands, grinds, sharpens, waxes, polishes. Nine drills, too. Model AP-10. In gift box, **$7.95**

PET POWER TOOLS

Favorite of "DO-IT-YOURSELFERS"

Look for the PET Christmas Tree Display at your dealer's!

PORTABLE ELECTRIC TOOLS, INC.
320 W. 83rd St., Dept. PS-122, Chicago 20, Ill.
In Canada: Portable Electric Tools, Ltd., Toronto, Ontario

Gus Rescues Ten Little Angels

[*Continued from page 234*]

in the line in front of the break. On level ground, the wooden section keeps the hole plugged up, and you have normal operation. I've warped the line away from the sharp spot and taped it up. . . Well, you people better get started."

"Can't I pay you for your work? No need to tell you how grateful—"

"Forget it. It's Christmas Eve."

Gus Says "Merry Christmas!"

Gus rapped on the window of the station wagon, shouted a "Merry Christmas!" to the kids and turned to get into his own car. But little Judy was trying to tell him something through the glass. Gus couldn't make out a word. Finally she got the window rolled down and stuck her head out.

"Please, Mr. Wilson, won't you come and hear us sing? We all want you to!"

Then the rest of the kids were all shouting at once. "Please do, Mr. Wilson!" . . . "We'll sing one just for you."

"Do come, Mr. Wilson," Lydia Randolph urged. "It would make them very happy."

In the face of such enthusiasm, Gus weakened rapidly. He felt sure the Rheingolds would forgive him for his tardiness when he told them the story. "Okay," he agreed with a wide grin, "let's get going!"

The children's delighted whoops of approval followed him as he climbed into his stone-cold car and started her up.

Ten Little Angels Sing

Forty minutes later, Gus was seated in the rear of the church, thawing out comfortably. The children, starched and shiny in white, looked like 10 little angels.

Then Judy's voice lifted above the others, high and clear, as the choir sang the first lovely notes of *Silent Night, Holy Night*. And as Gus sat there, warmed in heart as well as in body, it seemed to him that Christmas had already arrived, on this evening of December 24—and that it was the finest Christmas ever. END

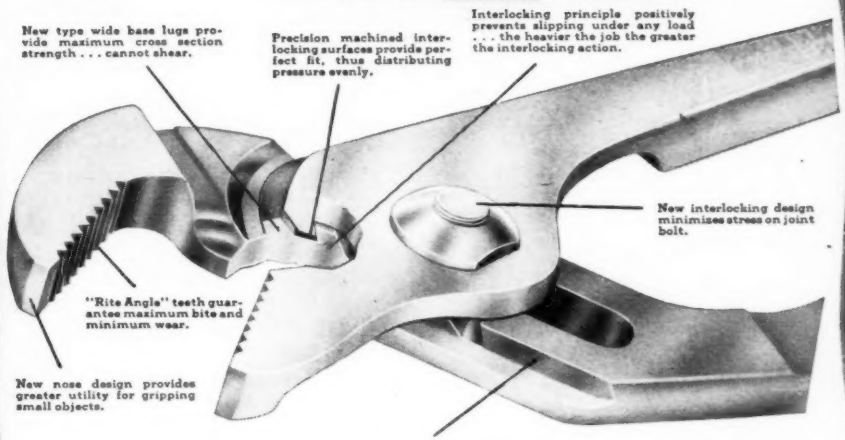
Going Is Better

Girl: "Sometimes my father takes things apart to see why they don't go."
Boy Friend: "So what?"
Girl: "So you had better go."—*The LIFE Aetna-Izer*

The plier design that OBSOLETES all others

THE NEW No. 420 CHANNELLOCK PLIER

TRADE MARK REG. U. S. PATENT OFFICE



Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools"

Here's the new, improved Channellock Plier—bringing to you new features which offer more positive gripping, greater strength and longer wear. The undercut interlocking channel is the first really new idea in plier design in years. Engineering skill has developed a plier with new patented features which give you the newest, strongest, most practical plier you can buy. Here is a plier that will last for years! Channellock Pliers—made only by Champion DeArment Tool Company, Meadville, Pa.

Send for your Catalog today.

Only CHAMPION DeARMENT makes CHANNELLOCK

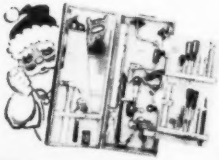
CHAMPION DeARMENT TOOL CO. • MEADVILLE, PA.

Merry Christmas!

STANLEY TOOLS

A Christmas "natural" to warm the heart of any man or boy! Give Stanley Tools . . . complete sets in chests or tools in Christmas boxes. Buy them at your hardware dealer's. Look for the famous STANLEY trade mark.

STANLEY TOOLS, NEW BRITAIN, CONN.

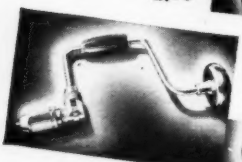


HOBBY HOUSE SET No. 910 — A top-notch group of tools to make any man or boy feel proud. $72.50*

OTHER CHESTS AND SETS FROM $23.75* UP

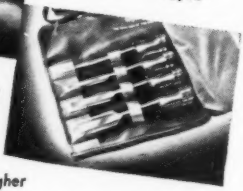
"YANKEE" PUSH DRILL No. 41 — None better for boring small holes in wood or plastics. 8 Drill Points in handle. $5.25*

STANLEY SCREW DRIVER SET No. X3000M — Five drivers for home use, and a handy kit to hold them. $2.80*



STANLEY BIT BRACE No. X1250 — Well-made for tough boring jobs. Beautifully finished. $4.25*

STANLEY CHISEL SET No. X64 — ¼", ½", ¾" and 1" with plastic handles and a kit to hold them. $10.50*



*Western Prices Slightly Higher

SEND FOR THIS BOOK—IDEAL FOR CHRISTMAS GIVING $2.00
Stanley Tools, 4122 Elm St., New Britain, Conn. In Canada: Stanley Tool Co. of Canada, Ltd., 4122 Stanley St., Roxton Pond, Quebec.

THE TOOL BOX OF THE WORLD

STANLEY

Reg. U.S. Pat. Off.

Hardware • Tools • Electric Tools • Steel Strapping • Steel

1953 Packard Has Power Steering

[Continued from page 118]

chanical movement of the Pitman arm.

Packard, to put it as simply as possible, has put the power boost between the Pitman arm and the steering linkage. The others have put it between the steering wheel and the Pitman arm.

All three types of power steering make use of the same source of power, a pump driven by a belt off the crankshaft. All three include a bypass valve, which immediately returns the car to normal steering in case the pump fails. That's an important safety factor. And, because of the hydraulic cushion of oil present at all times when the pump is operating, all reduce road shock and driving fatigue.

Packard Compromised

GM's power steering has a special difference from others. Its control valve contains compressed springs, and the valve doesn't work until the springs have been overloaded by a pull of about three pounds on the steering wheel. This was done to let the driver retain the full feel of the road when going straight ahead. But some people complain that it results in a squashy feeling, a sensation of not being firmly linked to the front wheels, when only a slight amount of pressure is applied to the steering wheel.

There are other people who complain, though, that Chrysler's power steering is too sensitive. That certainly has not been my experience with it.

Packard has succeeded in finding a compromise between the two.

There's a story to the effect that a small, slight woman, unassisted by power steering, has to exert as much strength to park a heavy car like a Packard as she would use to haul herself up a 15-foot rope. Packard has now spared her about 80 percent of that effort. END

This One Smells

"You're not eating your fish. What's wrong with it?"

"Long time no sea."—*The Columbian Crew.*

Want the greatest Christmas ever?

COME RIGHT OUT AND ASK YOUR FAMILY FOR THE

DELTA SHOP

...DOES 98% OF HOME-SHOP JOBS

Here's a one-motor combination shop that makes sense—the four most-used regular Delta Homecraft tools in a unit that takes only a 3-foot square—built around a husky 8" circular saw *with tilting blade.* Plus a big-capacity 4" jointer, versatile 11" drill press, sturdy disc sander. Not a group of attachments, no time-wasting setting-up and adjusting. Ready to work! Nothing to compare with it—for big value, small size and best of all, LOOK . . . only **$209.95*** including the steel stand.

Later, if you have more room for a bigger shop, it's easy to separate your Deltashop into individual tools. Or you can build the DELTASHOP tool-by-tool as your funds permit.

*Motor and motor accessories extra.

OR MAYBE YOUR SHOP NEEDS ONE OF THESE FINE TOOLS. . .

DELTA Homecraft 11" LATHE

for the expert who loves turning. Make furniture, lamps, toys, hundreds of excellent projects.

$57.25

DELTA Homecraft 10" BAND SAW

for inside and outside curve cuts, and for cutting stock too thick for the circular saw. For hardwood, too—and plastics, light metals.

$46.95

DELTA Homecraft 16" SCROLL SAW

Do intricate patterns and delicate cutting like marquetry, fine fret work, inlays, veneers, jig saw puzzles. A wonderful tool for starting your youngster's shop training.

$37.95

Special!

A DELTASHOP GIFT CERTIFICATE

Here's the ideal way to present this ideal gift for any man—get an attractive DELTASHOP Gift Certificate Box from any Delta dealer.

HAPPY NEWS FOR A MODEST CHRISTMAS BUDGET...

GIVE A DOWN-PAYMENT—What gift so appropriate for a family that watches the dimes, as a down-payment on a DELTASHOP! Delta dealers have an easy-payment plan; actually the tool soon pays for itself.

DELTA MILWAUKEE

DELTA POWER TOOL DIVISION

Rockwell MANUFACTURING COMPANY

504P NORTH LEXINGTON AVENUE • PITTSBURGH 8, PENNSYLVANIA

There's a Delta Power Tool for Your Job-

How Soon Will You Ride Jets?

[Continued from page 123]

the answer lies in reverse jet. And that's being worked on, too.

Q ***Any difficulties, then, in actual flying of the airplane?***

A Pilots agree that jets fly more easily than conventional planes. But there are problems that begin from the moment the jet pilot gets his clearance for take-off. Schedules must be much more rigid. Estimated time of arrival must be accurate within minutes so that there won't be any delay in getting landing clearance. A jet plane cannot afford to wait over an airport—especially at low altitudes where the engines hog fuel.

Navigation presents its own set of problems. At 40,000 feet radio signals from ground navigation-aid stations overlap so that several signals may be received at one time. Fewer stations may be the answer. Using ADF (Aircraft Direction Finder) or Loran, it takes a jet navigator up to five minutes to determine his exact location. By that time, at 600 miles an hour, the plane would have traveled 50 miles. Within the U.S., very-high-frequency radio does the job for him satisfactorily. But for over-ocean navigation there is no answer yet. True ground-speed indicators may be the solution.

Also, airborne radar is a must for commercial jets to enable the pilots to dodge turbulence, heavy rain, ice, hail and mountains while climbing. A pictorial, television-like presentation may be used. Douglas, for instance, has made provision in its commercial jet plans for a 10-inch-wide screen in the cockpit. END

Blonde Problem

A SCIENTIST says that in another 100 years there will be no blondes left in this country. No doubt. It's hard to leave one today.—*Pure Oil News.*

UNCLE WALTER

It's got EVERYTHING

HARLEY-DAVIDSON

HYDRA-GLIDE®

Years ahead in design. Miles ahead in power. It's loaded with features that make it the best motorcycle that ever came down the road. The improved 55 HP, 74 OHV motor has engineering advances few automobile engines can boast . . . hemispherical combustion chambers, hydraulic valve lifters and rotating valves. That means power to thrill you, speed to dazzle you, performance under any condition that makes you proud you own this most wanted of all motorcycles.

Try a ride today. See your Harley-Davidson dealer and take a buddy along. Or send 25¢ for illustrated literature and a copy of the Enthusiast magazine, filled with exciting action pictures and stories. Harley-Davidson Motor Co., Dept. PS, Milwaukee 1, Wisconsin.

HARLEY-DAVIDSONS
win national events
Peoria T. T. Championships
45" Class — 1st
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National Class C Hillclimb
1st in all 4 events!

"Here's a Year 'Round Gift... that's 3 Tools in One"

Ideal to Give or Get!
SARGENT PARALLEL-ACTION PLIER No. 102
the mechanical hand

Grips like a vise
Cuts wire easily
Holds nuts like a wrench
Gets into tight spots
Unkinks wire

Give a Sargent Parallel-Action Plier for Christmas . . . the favorite tool of mechanics, sportsmen, farmers and handymen everywhere. Finished in bright Nickel and available in 4½", 5½", 6½" and 8" lengths, in special Christmas boxes at your hardware dealer. For further details, write Dept. 26M.

SARGENT of New Haven ®

Builders Hardware and Fine Tools since 1864

Sargent and Company

NewYork • **NEW HAVEN, CONN.** • Chicago

Show this advertisement to your favorite Santa.

World's Most Mysterious Footprints

[*Continued from page 136*]

Tensing told Eric Shipton that he had seen a Snowman 25 yards away in 1950. The Snowman was, Tensing said, about five feet six inches tall, covered with reddish brown hair, but with a hairless face. He had a long, pointed head.

After cross-examining Tensing, Shipton said, "Whatever it was, it was neither a bear nor a monkey, with both of which animals he was very familiar."

Description Fits Cave Man

Is the Abominable Snowman—could he be—a man, a cave man perhaps? Scientists never have dug up the foot bones of a prehistoric man, but their drawings of cave men, based largely on skulls that have been unearthed, show hairy, crouching men with apelike brows.

It seems a fantastic idea. And yet prehistoric man lived in caves, like the caves found in the Himalayas. Cave men hunted with arrows, whose heads scientists have unearthed. Cave paintings show the bow. And cave men descended from their mountains to hunt woolly, horned beasts not unlike the yak.

Prehistoric man, scientists believe—again because of those skulls—had a great brain capacity and sharp eyes. He could conceivably keep out of sight of his enemies. Cave men buried their dead, often in the ground inside the caves. No body or skeleton of the Abominable Snowman has ever been found.

Himalayas a Land of Mystery

The Himalayas are 1,500 miles long and 150 miles across. They are largely unexplored. Nepal and Tibet for centuries were—and largely remain today—forbidden to white men.

Those explorers, mountaineers and scientists who have gotten into these lands have discovered hundreds of new insect species, including giant moths and locusts that are blown by gale winds even to the mountain peaks; fishes equipped with suckers to hold onto rocks against the mountain torrents;

[*Continued on page 244*]

HASTINGS PISTON RINGS

Tough

BUT OH SO

Gentle

TOUGH on oil-pumping

GENTLE on cylinder walls

Using too much oil? You need the piston rings that are *tough* on oil-pumping.

Want to stretch your engine's life? Then get the rings that are *gentle* on cylinder walls.

There's just one thing to do about worn-out piston rings and that's replace them—and the more you delay the more you'll pay.

You'll save money if you replace them with Hastings Piston Rings. They're engineered exclusively for replacement service. They *stop* oil-pumping, *check* cylinder wear, *restore* engine performance—for thousands of extra miles. It's the best money you can spend on your car.

HASTINGS MANUFACTURING CO., Hastings, Mich.
HASTINGS LTD., Toronto
Piston Rings, Spark Plugs, Oil Filters, Casite, Drout

HASTINGS

STEEL-VENT PISTON RINGS

Starrett PRECISION GROUND DIE AND FLAT STOCK

NOW AVAILABLE IN 4 TYPES - 295 SIZES

Big shops, small shops, mechanics and craftsmen — they all use Starrett Flat Stock. Ideal for making dies, gages, model and machine parts, special tools and precision pieces. Made of high grade annealed tool steel, precision ground to size — ready to layout and cut out. Comes in 18 and 36 inch lengths in a wide choice of widths and thicknesses — air, oil, oil or water, and water hardening types. See your industrial distributor—or write for information.

JUST LAY IT OUT AND SAW IT OUT WITH STARRETT BAND SAWS

Starrett Metal Cutting Band Saws are especially adapted for precision sawing and contour cutting. For best results, use Starrett Band Saws.

SEND FOR IT — ONLY 10¢
Starrett "Tools and Rules" Book
shows the right tools for any measuring job. 50 pages, 100 pictures, helpful reference tables. Address Dept. PS

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TRADE MARK
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WORLD'S GREATEST TOOLMAKERS
Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
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MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

World's Most Mysterious Footprints

[*Continued from page 242*]

gorgeous birds—woodpeckers, bee-eaters, sunbirds, peacocks and snow partridges; and strange animals like barkless wild dogs, cat bears, water shrews and bamboo rats.

Cave Men Do Live There

In the frigid hell of the upper mountains, even the dogs have wool and the pigs have thick coverings of hair. The yak has both: a coat of thick wool, covered outside by hair that hangs down like a bathrobe almost to its ankles and protects it legs and belly. A hairy man is not out of the question.

But of all the discoveries in the Himalayas, the one that grips the imagination most was made in 1921, the year Colonel Howard-Bury first reported the Snowman's tracks. That year, two Canadian explorers—Jill Crossley-Batt, a woman, and Dr. Irvine Baird—actually found in that region a tribe of 800 cave dwellers which had been isolated from the human race for centuries. These people had remarkable paintings on goatskin. They lived 17,000 feet high—higher than any other men are known to live.

Bear? Ape? Or Missing Link?

The Abominable Snowman may turn out to be a 100- or 200- or 400-pound bear or monkey or ape, or more than one of them, or something else again. Any of these could be something over five feet tall, the average height reported for Snowmen by those who say they have seen them. Eric Shipton is not on record with a definite statement of his opinion. But he has hinted.

"It may be," says Shipton, apparently thinking of the possibility of discovering a prehistoric mountain climber, "that our passion for mountaineering has a deeper origin than we suppose." END

Hooray!

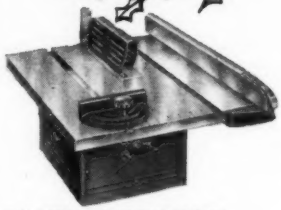
THE college yell of the school of experience is silence.—*Pure Oil News.*

PERFECT Christmas Gifts

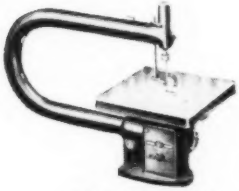
LOW COST QUALITY BUILT! Atlas Woodworking Tools

You'll hit the jackpot on Christmas Day with any man or scout-age son if you give one of these fine, low-cost Workshop tools. If it's his first power tool get a table saw, the basic shop tool. Note the 3 sizes and prices for your selection. If he has a power saw, then a jointer-planer is the tool for him . . . he'll use it on every woodworking project. A drill press will equip him for a host of practical time-and-money-saving operations. A band saw for sawing curves and irregular shapes, a jig-saw for all kinds of internal sawing will give him years of practical woodworking fun.

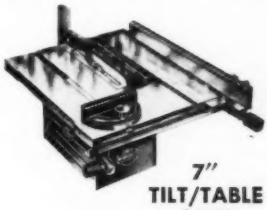
Ask your Atlas-Workshop tool dealer to show you the tools and all their fine construction features, or send a postcard and ask us to RUSH a catalog.



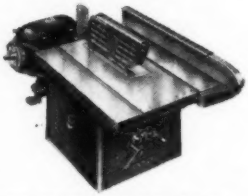
8" TILT/ARBOR SAW
ONLY $61.75



18" JIG SAW
ONLY $39.95

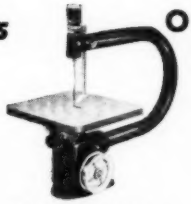


7" TILT/TABLE SAW
ONLY $27.75



7" TILT/ARBOR SAW
ONLY $44.75

Atlas WORKSHOP TOOLS



13" JIG SAW
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11¾" DRILL PRESS
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10" BAND SAW
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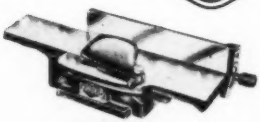
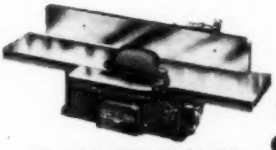


4" JOINTER-PLANER
ONLY $24.75



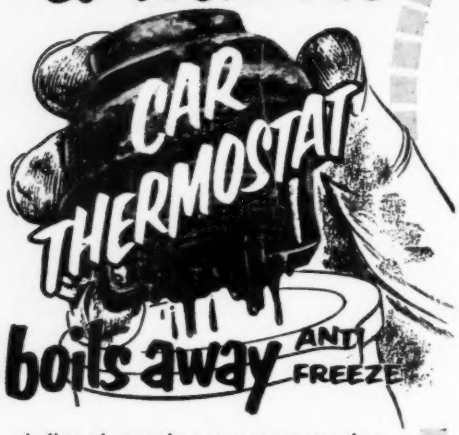
4" JOINTER-PLANER
ONLY $49.95

All prices F.O.B. Kalamazoo, less motor.

ATLAS PRESS COMPANY
1225 N. PITCHER ST. • KALAMAZOO, MICHIGAN

Atlas DEPENDABLE QUALITY TOOLS SINCE 1911

a Worn-out



A dirty, damaged or over-age motor thermostat impairs your car's cooling system, often resulting in engine "boil-overs", loss of anti-freeze. An over-heated engine wastes gas and oil . . . while one that runs cold fails to warm your car heater.

Protect both your comfort and pocketbook. Get your Service Man to check your car thermostat. And if a new one is needed –

Replace with Autostat® motor thermostat by Fulton Sylphon

for faster starts and faster warm-ups; more miles per gallon, more comfort per mile. Save oil and reduce car maintenance. Types for every make and model.

In home, industry, and transportation, EVERYTHING'S UNDER CONTROL

Robertshaw-Fulton
CONTROLS COMPANY
FULTON SYLPHON DIVISION
KNOXVILLE, TENN.
BRIDGEPORT THERMOSTAT DIVISION
BRIDGEPORT, CONN.

Biggest Science Stories of 1952

[*Continued from page 153*]

Fraley of *The Evening Bulletin* in Philadelphia. With the announcement that the fall of '52 would see an atom-bomb test that will result—if successful—in an "explosion greater than has ever been set off before," it looks to Fraley as if the age of the hydrogen bomb is here.

War May Become Obsolete

"From the vantage point of the scientist 100 years from now," he says, "that may be the only thing worth remembering, scientifically, about this year. The implications are staggering. The H-bomb may render war obsolete. Controlled nuclear fusion will give us sources of energy so potent that electronic machines will do most of man's hard work.

"A development that has even the potentiality of creating a world with limitless opportunity for constructive and creative pursuits is surely the biggest news story of the year."

Peaceful Use for H-Bomb Seen

The prospect of constructive use of the H-bomb reaction was the big story as **Watson Davis,** director of Science Service, sees it. He reports:

"Hints that the starting temperature of the fusion process is not necessarily millions of degrees have come from the latest studies of the sun and stars. If this is so, the peaceful harnessing of the H-bomb could follow. Controls would be needed, but would not be impossible.

"If the H-bomb can be made of peaceful and industrial use, there is a chance that it will be a blessing instead of a curse upon civilization. Any science achievement that could control people, or rather allow reasonable people to control the world, would be the top science story of all time." END

Gas Can Be Fatal

A SIGN in a western town reads: "4,029 people died of gas last year—two inhaled it, 27 put a lighted match to it, and 4,000 stepped on it. —*Pure Oil News.*

PREPARE NOW FOR POWER FAILURE!

WAR SURPLUS GENERATING PLANTS

Available for Immediate Delivery • Large Stock • Many Sizes from 350 Watts to 25 KVA

ITEM #183

Item #183—3000 to 4000 WATT GENERATOR SET — FEATURES — Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load. • Push button start or stop. • Easily made full automatic start or stop. **SPECIFICATIONS** — Sizes 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. • Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler, 6-volt starter, generator. Hobart 115 volt, 60 cycle, 3000 to 4000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's cost over $1200.00, SALE PRICE, F.O.B. Chicago **465.00**

Item #334—Power unit PE-77D is a compact electric generating set consisting of a 1-cylinder, 4 cycle, L head, air cooled, manual starting (rope) Briggs & Stratton gasoline engine, directly connected to a d-c self-exciting generator. The engine is rated 1.3 horsepower at 2650 revolutions per minute and operates 5 hours on one gallon of gas. The generator is rated 0.25 KW, 250/350 watts, 115 volts, 2.2 amperes direct current. Plug in to double receptacle for easy connection. F.O.B. Chicago. **115.00**

ITEM #301

Item #300—Model C1B—3 KW—110 Volts D.C. This mighty mite develops 3 KW—28.5 amps. D.C. Standard Delco generator direct coupled to a Model ZZP Briggs and Stratton 1 cylinder, 5-7 HP, air cooled, rope starting gas engine. Instruments include voltage control rheostat & voltmeter. Wt. 275 lbs. F.O.B. Chicago.... **295.00**

Tiny Tim Battery Charger

Item #301—Model 125 to charge 6 and 12 volt batteries —12 volts—300 Watts; Heavy Duty Generator; Automatic Shut-off; Push button self-starter; 2 qt. gasoline tank in base; Ammeter; Generator cut-out; Concealed coil, etc.; Speed and charging rate control; Attractive orange finish; Weight 33 lbs.; Length, 13½", width, 11¾", Height, 14¾". F.O.B. Chicago..... **89.00**

ITEM #178

Item #201—PE 95-G—10 KW—110/220 Volt 60 Cycle A.C.— Single Phase. Totally enclosed. Onan generator direct coupled to Willys Jeep, 4 cylinder, water cooled engine, push button start. Instrument panel with engine and generator instruments, circuit breaker, controls, etc. Uses 6 volt car battery. (Battery not incl.) Skid mounted. Ship. wt. 1500 lbs. F.O.B. Chicago **1295.00**

MANY WAR SURPLUS ITEMS

ORDER DIRECT FROM AD

Shop by Mail and Pay Less at GROBAN'S

LARGE SUPPLY

ALL ITEMS GUARANTEED

ITEM #350

LOGAN AIR CYLINDER Item #350 — Double acting pneumatic cylinder, 6" bore, 6" stroke, 1½" shaft. Adjustable cushions at both ends. Flange mounting at shaft end. Overall length closed 18". Ideal for use in 125 PSI systems. Shipping weight 40 lbs. F.O.B. Chicago. **39.50**

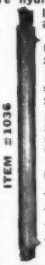
LOGAN 4-Way, Foot Operated AIR VALVE, Item #59, Model 6520—Ideal for operating air vises, presses, air machinery, and other double acting pneumatic devices. Heavy cast construction. Standard ½" pipe thread ports. Overall dimensions 8½" x 5¾" x 7½". Gov't. Acquisition cost $42.00. Shipping weight 28 lbs. An outstanding buy. F.O.B. Chicago **15.00**

ITEM #59

Item #16C—Double acting hydraulic cylinder, 1½" bore, 26" stroke. Will lift 1740 lbs. with 1000 PSI line pressure. Weight 8 lbs. A $55.00 value. Now only..... **16.95**

HEAVY DUTY HYDRAULIC and AIR EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc.

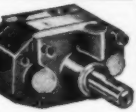


ITEM #1036

Item #6—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel. 1¼" stainless steel shaft. Ship. wt. 26 lbs. F.O.B. Chicago..... **28.00**

Item #1036—Double acting hydraulic, 3" bore, 36" stroke, ½" pipe thread ports, 1" solid steel shaft. Overall length closed 49", clevis mounting at base and shaft. FEATURES • Cup & Chevron Packing • All Welded Construction • Precision Ground and Honed Construction • ¼" Seamless Steel Tubing Cylinder Case. Weight (net) 575 lbs. F.O.B. Chicago **50.00**

PUMP PRESSURE (PSI)	LIFT CAPACITY (LBS.)
500	3535
1000	7069
1500	10604
2000	14138



Item #29KJ—Gear Type Hydraulic Pump. Ideal in industrial applications and for operating all hydraulically powered farm implements including loaders, stackers, swathers, plows, etc. Delivers 1000 PSI (may be set at lower PSI if desired). 12 GPM at 400 RPM. Maximum operating speed 800 RPM—rotation counter clockwise. Has built-in relief valve, permanent or torque bar mounting. 1" diameter shaft. ¾" pipe tap inlet. ½" pipe tap outlet. Ship. wt. 22 lbs. F.O.B. Chicago **45.50**

Item #126—Four-way, open center control valve with built in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive easy operation, can be used as single unit or mounted in series of any combinations desired. Has ¾" pipe thread inlet and outlet, ½" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8¼ lbs. An outstanding buy! F.O.B. Chicago ... **21.50**

Item #126

General Motors—Allison

CENTRIFUGAL PUMP 200 GALLONS PER MINUTE

Brand New

(ITEM #130)

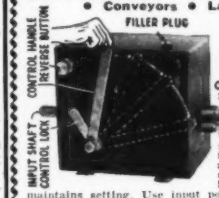
For Draining Basements • Fire Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering

Converted for high volume commercial, home, and industrial use. Standard 2½" pipe thread inlet, twin 1¼" pipe thread outlets. Ball bearing supported ¾" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost $145.00. Complete with full instructions. Ship. wt. 35 lbs. F.O.B. Chicago **39.50**

HYDRAULIC SPEED REDUCER

ITEM #115 WITH FINGERTIP CONTROL

USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • MotorBoats • Cream Separators • Garden Tractors • Pumps



Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of ¼ to 1½ H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions. 7½"x7½"x11½". Gov't acquisition cost, $428.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

NEW MODEL 353 — DUAL RANGE

ARC WELDER

for Stationary or Portable Use

Heavy Duty Range To 250 AMPS.

New 'Magic Terminal' For Low Current 30 to 100 Amps

Welds Anything From Auto Fenders To Tractor Frames

IDEAL FOR • FARM • GARAGE • FACTORY • WORKSHOP. These precision engineered D. C. Arc Welders contain the highest quality War Surplus aircraft components built to exacting government specifications. They are light in weight, have oversized lifetime grease-sealed ball bearings, air cooled commentator, dial type rheostat for easy pin-point control, a high-low rheostat switch, reactor coil for even arc and the new 'MAGIC TERMINAL' low current welding range for welding lighter materials. Designed for many years of trouble-free service. Run welder from drive pulley or power take off of a tractor or Jeep. 7½ HP electric motor or 10 HP gas engine at 2500 R.P.M. Uses two V belts or flat belt. Continuous output rating 200 amps. Intermittent welding rating 250 amps. 30 volts. This sensational price includes double V or flat belt pulley and complete operating instructions. Ship. Wt. 107 lbs. $350.00 Value. **Item #65.** Now only.. **119.50** F.O.B. Chicago

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New handy panels make this versatile chest easy-to-build

Start it Friday night . . . finish it Sunday. This combination desk, vanity or buffet . . . created by Norman Cherner Associates, one of America's top designer firms . . . is easy to build with real wood panels of Douglas fir plywood—especially with the new, small-size plywood Handy Panels. Why not have a fine occasional piece like this. Send coupon below for complete plans and instructions.

NOW AT YOUR LUMBER DEALERS IN NEW SELF-SERVICE RACKS

Fir plywood Handy Panels are about 2x4 feet—easy to handle, easy to select, easy to work. Clearly marked for size, grade and price. Ask your lumber dealer.

DOUGLAS FIR PLYWOOD **handy panels**

MAIL COUPON TODAY FOR EASY-TO-FOLLOW PLANS

Douglas Fir Plywood Association, Dept. 12B, Tacoma 2, Washington (Good U.S.A. Only)

Please send me plans for Douglas fir plywood desk-chest combination. I enclose 10 cents to cover costs.

Name.....

Address.....

City.....Zone.....State.....

Bouncing Putty

[*Continued from page 159*]

at any price. Silicone paints, for example, are cutting down the number of repaint jobs required on ships, utility towers and road signs. One paint will shortly be tested on big bridges in New York and California. Prices of these new materials are dropping steadily and, meanwhile, manufacturers are already getting some silicone-paint benefits into our homes by retailing enamels and water-base paints which are fortified with a dash of silicone, to give a smoother finish and improved washability.

Millions of Combinations Possible

The chemists themselves don't know yet how many different kinds of silicones they can make. By altering the silicone chain's molecular architecture, it is theoretically possible to construct millions of organo-silicon compounds. Only a few thousand of these have so far been made. And even the possibilities of these have by no means all been thought of.

A few years ago, for example, someone discovered that certain silicones are the most effective "release agents" yet known. A release agent is the opposite of an adhesive—a substance which prevents materials from sticking to each other.

Cleaner Cars and Stickproof Waffles

Silicone-fluid release agents now keep automobile tires from sticking to their factory molds, with an 80-percent saving on previous scrap and reject costs. In bakeries a single application of a silicone pan glaze will release up to 200 successive bakes from the bread pans. Although such glazes can't be applied in home kitchens, a related home anti-sticker called Pantastic simplifies cleaning sticky food from pots, pans and stove burners.

Alert manufacturers now coat their waffle irons with a silicone release agent before they leave the assembly line. Silicone-treated tissues keep your eye-

[*Continued on page 250*]

FOR EASIER SCRATCH-FREE SANDING . . . . . USE DREMEL STRAIGHT-LINE ACTION SANDERS

Christmas Gift Idea!

Here's a gift the whole family can **enjoy** and really **use.** Give the handyman of the house a Dremel heavy-duty Model 2000—a professional tool for sanding dry-wall's; refinishing woodwork, furniture, panelling; polishing furniture, cars, etc. Dremel Model "A" is a family favorite for polishing, buffing, dozens of household duties and hobby projects; also a relaxing massager. For gifts that will really be used and appreciated, give Dremel Electric Sanders.

Only Dremel Offers All These Features:

WORLD'S FINEST FINISHING SANDER—Patented straight-line (with-the-grain) action duplicates craftsman's hand-sanding motion . . . the **only** way to be sure of super-smooth, **scratch-free** finishes . . . no gouging, no cross-grain swirls or scratches.

MORE SANDING SURFACE PER DOLLAR—You can't beat a Dremel for work! Largest sanding pad surface per dollar cost. Faster action (14,400 working strokes per minute) . . . more than **three times** as fast as most sanders!

EASY, ONE-HAND OPERATION—Light weight; less tiring for vertical or overhead sanding; higher speed means less down-pressure required for effective sanding.

SANDS INTO CORNERS—Rectangular, over-size sanding pad permits sanding into corners, over tight places.

TROUBLE-FREE USE—Only 2 moving parts; never needs oiling. No armatures, brushes, gears or bearings to wear out and replace.

POWERFUL—High-speed lifetime reciprocating motor (110 v. 60 cycle AC).

FREE SANDING GUIDE

SANDING GUIDE

A handy, 16-page "How-to-do-it" booklet containing helpful hints on sanding and refinishing procedures packed FREE with each Dremel Sander. Extra copies, 25c.

MAKE THIS SIMPLE TEST!

Sand a piece of wood, by hand, using the four different sander motions illustrated below. Note how the slightest cross-grain action produces scratches and swirls . . . how sanding **with-the-grain** leaves a scratch-free, satin finish. This test proves conclusively why professional craftsmen **always** sand with the grain of the wood . . . never cross grain. YOU BE THE JUDGE! If you are not 100% convinced that Dremel straight-line action is the finest, most effective sanding method known, we sincerely don't want you to buy.

Model 2000

Heavy-duty model; 21 sq. in. (3⅛"x7") sanding base. Price includes sturdy steel storage case (left) with handy carrying handle; 25 asst'd. abrasives, 1 sheepskin pad..... $24.50

Model "A"

Household and hobby model (above, right); 12 sq. in. (2¾"x5¾") sanding base. Price includes 6 abrasives; 1 sheepskin pad; 1 felt pad $14.85

A "must" for sanding dry-wall joints.

Fast—cuts refinishing time in half.

Sands right into tight corners.

Prepares furniture for repainting.

GRINDS • CARVES • DRILLS • ROUTS • ENGRAVES • SHARPENS

DREMEL *Electric* MOTO-TOOL

FASTEST MOST POWERFUL TOOL IN ITS CLASS—APPROX. 27,000 R.P.M.

Most practical tool a man can own—more powerful than any similar tool you can buy. Works well in wood, plastics, and metal. For home maintenance jobs you'll wonder how you got along without it. For model making it's a must. And for general shop operations it saves time and money. Compare it, try it, buy it. You be the judge.

Check These Important Features: Oilless sealed bearing ● Dynamically balanced armature ● Shockproof, Bakelite housing ● Dust-filtered air cooling system ● Sturdy 110-120 V., A.C.-D.C. motor ● Wt. only 13 oz. ● A precision tool widely used in industry for many years.

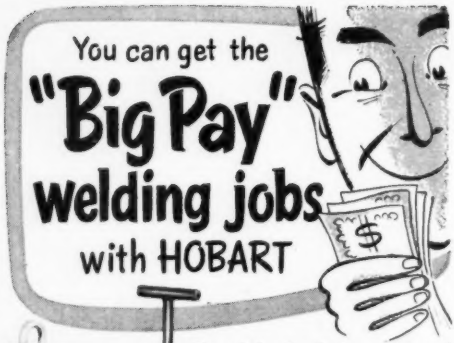
KIT NO. 2. Includes Model 2 Moto-Tool and 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers). Packed in sturdy hardwood case..... $23.50

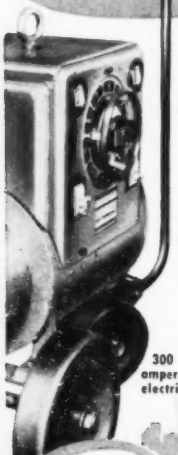
KIT NO. 1. Includes Model 1 Moto-Tool and 34 Accessories (Steel Cutters, Grinding Wheels, Polishers, etc.). Packed in attractive lacquer-finished wood case..... $17.50

MOTO-TOOL NO. 2. Offers more convenience and long life features for the money than any other hand grinder. Thousands of satisfied users. Moto-Tool No. 2 (With 1 emery wheel point)..... $16.50

SEE YOUR LOCAL DEALER. Dremel Tools are sold at better dealers everywhere. If your dealer can't supply, order direct on a five day trial, money-back guarantee. Remit in full, and we will ship postpaid. Or, send only $2.00 now, pay postman balance plus postage and C.O.D. fee.

DREMEL MANUFACTURING CO. Dept. 122-M RACINE, WIS.





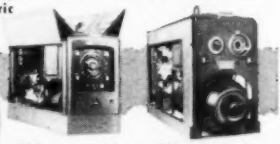
Never before has the demand for good arc welding been so great nor the profits so large. Shops furnishing dependable welding work are badly needed in every town.

Cash in on this opportunity now! Be independent, add to your income, set up your own welding department or business with Hobart. With average mechanical ability, you'll soon be earning Hundreds of Dollars of extra profit monthly doing every kind of job for factories, builders, farmers, etc.

Hobart Welders assure better, stronger, faster, lower cost welds. That's why they're used in America's leading industrial and production plants where quality is a must. They go anywhere—handle any job—give you 1000 combinations of heat—plus remote control—which means easier welding. Choice of Electric or Gas Engine Drive models, portable or stationary. Check coupon for details.

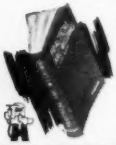
300 ampere electric

Learn to weld quickly at HOBART Trade School



300 amp. gas drive 250 amp. gas drive

Modern, non-profit school. Complete or "brush-up" courses. Best equipment, thorough training, experienced instructors. Learn by doing. Check coupon for booklet.



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TEXT AND LESSONS BOOK. Covers every phase of welding 544 pages, 600 illus. **$3.00**
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City_____ State_____

Bouncing Putty

[*Continued from page 248*]

glasses clean, and silicone polishes keep grime from sticking to your car.

Three years ago silicone processors began to market the most effective water-repellents ever developed for above-ground masonry. Paraffins and soaps formerly used for this purpose rarely lasted more than nine months. Silicone treatments applied three winters ago are still sternly excluding water, and tests indicate that they may last eight to 10 years.

Clothes That Won't Get Wet

The same freezing expansion of internal moisture that cracks and erodes home brickwork and stucco is one of the major causes of concrete road deterioration. Tests begun last fall on a heavily traveled Massachusetts road indicate that silicone water repellents may add as much as 10 years to the normal life of a concrete highway.

Relatives of the masonry water repellents work their magic on textiles, too. At General Electric's laboratories in Waterford, N. Y., Dr. Charles E. Reed, who heads up GE's silicone research and production, showed me a square of silicone-treated cotton cloth resembling a pocket handkerchief. He stretched it taut on a small frame, put it under a nozzle and turned on the spray. The water just bounced off and left the cloth as dry as before. Furthermore, the silicone treatment doesn't seal weave openings. It makes the individual fibers "hydrophobic"—water-hating—but leaves the fabric and the wearer's skin free to breathe. That's why silicone-treated clothing is cooler and more comfortable than plastic or rubberized garments.

Repellents Won't Wash Out

Silicone water repellents can now be factory-applied, safely and simply, to all types of textile fibers, natural or synthetic—silk, wool, rayon, nylon, even furs. They neither weaken nor discolor the fabric. Moreover, treated materials

[*Continued on page 252*]

Don't Let Your Engine Get Old This Winter

Mechanics know that most engine wear occurs in winter. That's because oil is cold, stiff, slow to get around to all moving parts. So you have longer periods of DRY STARTING which causes loss of performance and eventual repair bills.

That's why mechanics say, "Use Miracle Power in gas and oil." Miracle Power contains colloidal synthetic graphite in suspension. This graphite forms a breathlike, protective film on engine surfaces . . . lubricates instantly . . . provides a better compression seal.

Result: You keep your engine young—it starts easier, has more power, uses less gas and oil.

Protect your car this winter—it may have to last you longer than you think. Try Miracle Power next time you get gas.

Miracle Power Division
THE AP PARTS CORPORATION
853 AP BUILDING, TOLEDO 1, OHIO

At better service stations, garages and car dealers, or use this coupon for introductory offer.

Now! Push Button Lubrication!

Miracle Power Pres-A-Luber is ideal for car engines as well as general household lubrication. Just push the button for a fine Miracle Power spray that reaches all the hard-to-get-at places.

Also available are Pres-A-Lubers containing def 123—companion product to Miracle Power for use as a dry pre-lubricant during engine re-assembly.

THE AP PARTS CORPORATION
853 AP BUILDING, TOLEDO 1, OHIO

Enclosed find $.....for which please send me *postpaid:*

..... trial cans of Miracle Power at 75c each (1 for gas, 1 for oil)

Please send me free literature on making my car last longer.

Name_____

Address_____

City_____ Zone_____ State_____

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Bouncing Putty

[Continued from page 250]

keep up to 90 percent of their water repellency after repeated machine washings or many dry cleanings.

The cost of the silicones needed to treat enough cloth for a man's suit is less than 25 cents.

Silicone-treated raincoats and snowsuits are already on sale. Fast-drying umbrellas, bathing suits, convertible-auto tops, rain-shedding everyday garments will follow soon. And Dow-Corning is working on a water repellent for shoe leather which should measurably allay motherhood's eternal concern over little wet feet.

Even Waterproofs Skin

Businessmen are already finding the silicones' endless versatility a key to all sorts of new businesses. In 1945 a Wisconsin fishing enthusiast named Richard L. Talbot decided to try a water-repellent silicone coating on his dry flies and fly lines instead of the bear-fat concoctions he had been using. Finding it superior to any water repellent on the market, he quit his job and went into business putting up and selling a dry-fly liquid trade-named Silicote.

With two infants, Talbot's wife was constantly washing baby clothes. One day in desperation she decided to waterproof her hands, which had become raw and irritated. She rubbed her husband's silicone dressing on them every day for a week. Her skin irritation disappeared.

Cautiously she tried the silicone on her children's diaper rash. The rash vanished overnight, and soon Talbot's Silicote fly-line dressing was dressing more babies' bottoms than fishing lines.

Doctors of the University of Wisconsin Medical School reported last year, in *The Journal of Investigative Dermatology*, that Silicote had cured or controlled

[Continued on page 254]

SURPLUS MACHINE SHOP TOOLS AT PRICES YOU CAN AFFORD

HIGH SPEED STRAIGHT SHANK DRILLS

SET 6H 30 selected H. S. Straight Shank Drills from 1/8" to 1/4", lengths up to 7". $15 value, only **$2.98**

SET 19H 100 HIGH SPEED DRILLS: 1/4" down. 30 new std. H. S. Drills — 70 slightly used sharp drills, lengths up to 7". $30 value. PPD. Only..... **$7.98**

SET 7H 12 Different size H. S. straight shank Drills. 1/4" to 1/2", lengths up to 7". Only..... **$3.98**

HIGH SPEED DRILLS

1/4" TO 17/32" WITH 1/4" SHANKS!

SET 35H 6 different size H. S. Drills, 1/4" to 17/32" all with 1/4" shanks. PPD..... **$2.98**

SET 36H 10 of above. PPD..... **$4.95**

Sets 35H and 36H will fit any 1/4" drill.

HIGH SPEED DRILLS

1/2" to 1-3/16" WITH 1/2" SHANKS!

5 Drills for less than the price of one new Drill!

SET 32H 5 different size H. S. Drills 1/2" to 1-3/16"..... **$7.95**

SET 33H 10 different size H. S. Drills 1/2" to 1-3/16".. **$14.50**

These new and used H. S. precision Drills with 1/2" shanks can be used in a 1/2" elec. drill or a 1/2" capacity lathe or drill press.

HIGH SPEED MORSE TAPER SHANK DRILLS

SET 9H 15 Different Size High Speed Morse Taper Shank Drills up to 9/16" with No. 1 and 2 tapers. New and used. $50 value. Priced at only..... **$6.49**

SET 10H 20 Different Size High Speed Morse Taper Shank Drills from 1/4" to 1". New and used. $70 value. Priced at only..... **$12.95**

SET 15H 10 Different Size High Speed Morse Taper Shank Drills from 1/2" to 1 1/4". New and used. $50 value. Priced at only..... **$9.95**

SET 37H 8 Different Size High Speed Morse Taper Shank Drills from 1" to 2" with No. 3, 4, and 5 tapers. New and used. $125 value. Priced only..... **$29.95**

NEW MOUNTED STONES

SET 27H Mixture of 12 Mounted Stones with 1/4" shanks. PPD.... **$2.95**

HIGH SPEED WOODRUFF KEY SEAT CUTTER

SET 4H 5 different size cutters. Can be used as mounted milling cutter or circular saw. All with 3/8" and 1/2" shanks, widths up to 1/4", dia. up to 1". New and used. Ppd. Priced at only.... **$3.95**

NEW ROTARY FILE MIX

7 different pcs., High Speed 1/4" shank. PPD. . **$4.49**

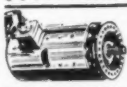
SET 22H 14 different pcs. as above. PPD. ... **$8.79**

H. S. TAPER SHANK CHUCKING REAMERS

SET 25H 15 Different Size High Speed Morse Taper Shank Chucking Reamers up to 1/2" with No. 1 and 2 tapers. New and used. Priced at only..... **$7.95**

SET 13H 8 Different Size High Speed Morse Taper Shank Chucking Reamers from 1/4" to 1". New and used. Priced at only. **$6.95**

GENERATORS!



P1 GENERATOR 200-amp. 24-volt, continuous duty. Wt. 48 lbs. Special closeout price. F.O.B. Tulsa..... **$14.98**

E5A GENERATOR: 50-amp. 12 volt continuous duty. Wt. 21 lbs. F.O.B. Tulsa. Only..... **$9.98**

These used, guaranteed serviceable aircraft quality generators are easily convertible for welders, power plants, boats, platers, etc.

2 H. P. MOTOR 24-volt, 90-amp. double end ball-bearing shaft. Wt. 18 lbs. F.O.B. Tulsa, only..... **$7.00**

NEW HIGH SPEED COMBINATION DRILL AND COUNTERSINKS

SET 2H 8 selected sizes from A1 to F2 (3/64" drill x 1/8" body to 3/16" drill x 7/16" body) 60° angle of countersink. New cost on these countersinks 75c to $2.50 ea. Priced to you Ppd. at only..... **$3.98**

24-VOLT TRANSFORMER: 110-volt A. C. to 24-volt, 3 amps. Just the thing for small 24-volt motors..... **$1.95**

HYDRAULIC BARGAIN DEPT.

New Hydraulic Hose!!
2000 lb. Test

Length in feet	Price 1/4" ID
1	$ .75
2	1.00
3	1.20
4	1.45
5	1.70
6	1.95
7	2.30
8	2.55
9	2.80
10	3.00

- Any Length
- 1/4" Std. Pipe Connections

1/4" Hose has 1/4" male pipe connections. 11 to 50-ft. lengths available at 20c per foot. Above prices quoted complete with fittings. Finest construction double wire internal braid. Carries 3 GPM at 1000 PSI. Discounts on large quantities.

PESCO HYDRAULIC GEAR TYPE PUMP

Rated at 3 GPM, 3750 RPM, 1500 PSI. 1/2" drive spline. Gov't cost over $90. Yours for only..... **$9.49**

BARGAIN TOOL & SHOP MIXES—PPD.

- 30 GRINDING WHEELS 1/4" arbor, 4" diameter max..... **$3.29**
- 2—8" WIRE WHEELS coarse and fine, 1" thick, 5/8" bore. Pair only **$2.29**
- 300 SPRINGS all types and sizes..... **$1.79**
- 100 MOUNTED POINTS 1/8" and 3/32" shanks. Various shapes **$8.98**
- SURPRISE MIX: Over 50 pcs. for your 1/4" elec. drill including rotary files, drills, bits, reamers, grinding wheels and arbors for our customers who like pleasant surprises. Your money back if you aren't satisfied..... **$2.98**
- BEARING MIX: About 40 needle, ball and roller bearings; new and used. Up to 2 1/2" dia. approx. 5 lbs. Outstanding buy at..... **$2.95**
- RIVET MIX: 5 lbs. assorted rivets; cherry, explosive, etc. Hundreds of rivets..... **$2.29**

6 SLITTING SAWS WITH MANDREL

SET 34H 6 Different Size High Speed Slitting Saws, 5 pcs. 2 3/4" dia. x 1" arbor, plus 1 pc. 5" dia. x 1/2" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" elec. drill. $25 value. PPD. Only..... **$4.95**

7 selected, sharp H. S. Slitting Saws as above to use on your own mandrel or milling machine. New and used. PPD. A bargain at..... **$4.95**

Money-Back Guarantee On RECEIPT of Merchandise. All mdse. mixture of new and reconditioned unless specified new. All orders (Except those specified F.O.B. Tulsa) are shipped Post Paid, saving you up to 25% on total delivered cost!

Write For Free Catalog Describing Thousands of Bargain Cutting Tools.

T & T TOOL 221 W. SECOND TULSA, OKLA.

U. S. Patents No. 2,351,906 No. 2,461,872

Save Fingers with Steel-Grip Finger Guards

Lower Your Hand Protection Cost

Hundreds of factories save time and injuries by protecting workers with Steel-Grip Open End Finger Guards. For handling rough, sharp particles, buffing, grinding, sanding, punch press work, and hundreds of other jobs. Protect fingers or thumbs, front or back, from cuts, abrasions or blisters. Various designs in leathers and other materials; elastic web back for snug, cool, comfortable fit. Sizes for men and women. Send 10¢ for sample. *Catalog of Safety Apparel Free.*

INDUSTRIAL GLOVES COMPANY
A Corporation
1420 Garfield St., Danville, Ill.
(In Canada, Safety Supply Co., Toronto)

To be Sure of the Genuine Demand This Trade Mark

FAMOUS INDUSTRIAL SAFEGUARDS SINCE 1910

U.S. GOV'T CLOSEOUT *Wire*

THIS WIRE HAS NOT BEEN OVERSEAS

This high quality two conductor communication wire offered in No. 18 and No. 22 gauge is ideal for intercoms, lead-ins, telephones, indoor and outdoor speaker extensions, doorbells, signal and burglar alarm systems, shot firing, etc., etc. **SAMPLES ON REQUEST.**

NEW WAR SURPLUS
Mfgd. to rigid Signal Corps specifications

U. S. Signal Corps Communication Wire
TWISTED TWO CONDUCTOR No. 18 STRANDED per 1000 ft. **$5.00**
$7.50 per 1300 ft. TWISTED TWO CONDUCTOR No. 22 STRANDED

Won't Last Very Long at These Prices

Stock Up Now—Subject to Prior Sale—Order Today

W-110-8—TWO CONDUCTOR #18 STRANDED (four steel and three copper strands) rubber covered plus weatherproof cotton braid and twisted. 5,280 feet per steel reel. **Only $3.50 per thousand feet on 5,280 foot reels or $18.25 per reel.**

W-130—TWO CONDUCTOR #22 STRANDED and twisted (one copper and six steel strands) in your choice of rubber or plastic insulation. 10,000 feet per steel reel. **Only $3.50 per thousand feet on 10,000 foot steel reel or $35.00 per reel. (Note: Steel strands are incorporated for extra tensile strength and are tinned and treated for efficient conductivity.)**

All these way below market prices, our stock will not last long. Take advantage of this exceptional closeout and **STOCK UP NOW!**

Prices F.O.B. Chicago. Include approx. postage on orders paid for in advance. C.O.D. orders enclose 25%, balance sent C.O.D.

U. A. S. Corp. Dept. PS12 5637 W. 63rd Pl. Chicago, Ill.

$9.95 UP AVAILABLE IN FOUR MODELS TO MEET EVERY NEED! (See Complete Price List Below)

ATTACHES IN ONE MINUTE TO ANY 1/4" ELECTRIC DRILL

CUTS 8-TIMES FASTER THAN A HANDSAW!

Now, here is the first gear driven saw attachment for electric drills that will go through 2x4's in **one easy cut.** Comes equipped with a 5-inch "ARCO SAFECUT" Sawblade—the smoothest, fastest cutting sawblade made. Whizzes through lumber, plywood, wallboard, etc.

ONLY "ARCO" GIVES YOU THESE FEATURES:

5-inch "ARCO SAFECUT" SAFETY SAWBLADE—uses 30% less power, allows, small drill to cut thru heavy wood. **Precision Graduated Depth & Bevel Gages** for cuts to 1¾" in depth, bevels from 0 to 45°. **Adjustable Rip Gage** for accurate strips. **Adjustable Visual Guide** (not shown) for straight & bevel cuts. **Sturdiest, Most Easily Adjusted Safety-Yoke** for absolute safety, keeps drill steady & vibration-free. **Worm Drive Clamp** releases drill in seconds for other work. **Precision Gear Box with Steel Gears. Self-lubricating Lifetime Bearings. 90-DAY FACTORY GUARANTEE.**

No. 455 "ARCO-SAW" (shown above) with ALL GAGES & 5" SAFECUT Blade. MAX. CUT: 1¾"... **$12.50**

No. 454 "ARCO-SAW". Same as above, less gages. Has accurate Visual Guide. MAX. CUT: 1-15/16"... **$10.95**

No. 445 "ARCO-SAW" with ALL GAGES & 4" "HYCARBON" Crosscut Blade. MAX. CUT: 1¼"... **$11.50**

No. 444 "ARCO-SAW". Same as No. 445, less gages. Has accurate Visual Guide. MAX. CUT: 1-5/16"... **$9.95**

REPLACEMENT BLADES: Specify Safecut, 5" BLADE... **$1.75** or Combination, or Rip, or Crosscut Style 4" BLADE... **$1.60**

NEW! 'ARCO STAND 'N TABLE'

MAKES A WORKSHOP OUT OF EVERY 1/4" ELECTRIC DRILL!

HAS TILTING TABLE FOR Sanding, Grinding, Buffing, etc.

No. 400 $7.95

Sturdy Aluminum Castings hold complete unit vibration-free, allows operator to use both hands. Consists of strong **Drill Stand** with Worm Drive **Clamp** and adjustable **Table.** Tilts to 45°, adjusts up or down for various jobs. Rubber cushioned **Sander** for beautiful sanding, can also be used in drill alone or drill press. **6 Sanding Discs and "Speed Cement".**

No. 401 "ARCO STAND" consists of Drill Stand & Worm Drive Clamp only..... **$2.75**

NEW! 'ARCO SAFECUT' SAFETY SAWBLADES

The Safest, Fastest Cutting Sawblade Ever Made! Made of finest tempered tool steel. No "Kick-back" accidents — cannot drag hand into blade. Easily & quickly resharpened with ordinary handfile.

6" Blade...$1.75 7" Blade...$1.95 8" Blade...$2.15

Special Bores for Skil, Mail, B&D Saws—Add 30c

10-DAY MONEY BACK GUARANTEE ON ALL ITEMS

DEALERS: Write for nearest jobber

BUY THE BEST—see your hardware dealer now! Don't accept inferior substitutes—if not available send us check or M.O. (Postpaid). C.O.D.'s—postage extra.

ARROW METAL PRODUCTS CO.

Dept. PS-12, 140 WEST BROADWAY, N. Y. 13, N. Y.

CHOOSE FROM PROFESSIONAL QUALITY

WESTCRAFT TOOLS

AT **WESTERN AUTO**

Bouncing Putty

[*Continued from page 252*]

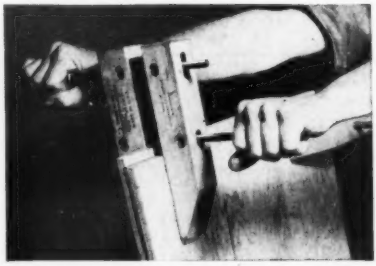
58 of the 61 cases of stubborn externally caused skin irritation they tried it on.

In other ways, too, the silicones' unique talents make them a valuable new weapon in the medical arsenal. In Cambridge, Mass., two doctors have perfected a new "artificial kidney" far more compact than the huge, unwieldy devices formerly used. In cases where normal kidney function may be temporarily interrupted, the patient's blood is piped through a silicone-coated glass chamber where it is cleansed of poisons normally excreted through the kidneys. The silicone—a water repellent—retards the rapid, and in this instance dangerous, clotting normally caused by blood's contact with uncoated glass surfaces. Blood banks use the same silicone on bottles, tubes and syringes.

Other dramatic uses for the silicones will soon emerge from laboratory experiments now going on. But the evidence today indicates that this fascinating new material will prove to be one of the most versatile and useful gifts which science has bequeathed us. END

Next Month . . .

All About Glues and Gluing



Expert glue joints are the heart of good woodworking. Next month PSM will publish one of the biggest and most thorough-going articles we have ever run—a study on what glue to use for every job, how to use it most efficiently, and what short cuts you can and cannot take. Special associated articles will tell you about joint fit-up, clamping, and ways to lick gluing problems. Don't miss "All About Glues and Gluing."

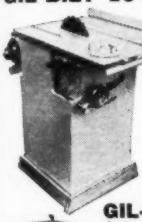
BUILD YOUR OWN POWER TOOLS—TILT/ARBOR SAW

BANDSAW
BELT SANDER
SAVE $50. OR MORE

Exclusive GIL-BILT Build-It-Yourself Features

- No machining—build easily with hand tools only
- No blueprint reading—step-by-step pictorial plans, full scale patterns, actual photographs
- Sturdy wood, aluminum and steel construction
- Capacity and performance of commercial saws selling for $60 and up

GIL-BILT 10-INCH TILTING ARBOR SAW



- 27x28 in. table, 13½ in. capacity in front of blade
- 10 in. blade cuts 3¼ in. deep, tilts full 45 degrees
- Floor model 34" high, table always stays level
- New Departure ball bearing arbor, ¾" precision shaft turned down for ⅝" bore blades, alum. housing, shipped ready to run.
- Jackscrew and 4½ in. dia. handwheel lowers and raises blade
- Cast aluminum miter gauge and self-aligning rip fence guide

GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jack screw mechanism and handwheel, and all other metal parts (less blade).....$21.95
Same Kit with 10" Combination Blade...$24.90
Same Kit with 8" Combination Blade....$23.90

GIL-BILT 12-INCH BAND SAW

- Cuts to center of 24 inch circle
- Handles stock up to 6 inch thick
- 18x18 inch table tilts 45 degrees
- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings: Upper wheel runs on two ⅝" bore Oilite Bronze bearings.
- Upper wheel tension and tilt mechanism of cast aluminum, completely assembled
- Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws
- Rigid cast aluminum wheels fully machined ready-to-install. Heavy rubber tires.
- Uses standard 78 inch blades up to ¾ in. wide
- Fully enclosed mechanism for utmost safety

GIL-BILT Metal Parts Kit includes Plans, rubber tires, aluminum wheels, 1½ in. blade, ball bearing spindle, tilt mechanism, blade guides, table tilt segments, and all other metal parts.....$21.95

Return Kits in 10 days for refund if not satisfied.

(Prices include postage within 300 miles. Over 300 add 5%)

Also available—Plans and Parts Kit for 18" Band Saw, Belt Sander and 8" Tilt/Table Saw. Order Plans at $1.00 each—Sent postpaid anywhere in the world or write for FREE descriptive catalog.

GILLIOM POWER TOOLS P.O. Box 1-VM, Lambert Field St. Louis 21, Missouri

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Experts' Painting Tips-FREE

Lifetime of experience with aluminum paint, yours free—write for free 24-page illustrated book. Tells how to buy and apply right kinds of aluminum paint. We don't make paint but have prepared this to help you get best results. Just write for "Paint it Bright."

ALUMINUM COMPANY OF AMERICA, 1717M GULF BLDG., PITTSBURGH 19, PA.

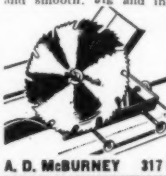
NEW, IMPROVED CALCULATOR FOR WOODWORKERS only 25¢

Instantly gives information on lumber, nails, concrete mixes, painting materials, etc. Convenient, simple to read. Just set dial for nail specifications, to convert linear to board feet, find bit sizes for screws, compare characteristics of woods. 6" diameter heavily varnished cardboard. Send 25¢, no stamps, please to Greenlee Tool Co., 2132 Columbia Avenue, Rockford, Illinois.

FILE SAWS THE RIGHT WAY

SO EASY: With this new filing jig and jointer anyone can now sharpen any handsaw like new! When file hits hardened steel rollers teeth are finished and EXACTLY SAME HEIGHT. All teeth cut and saw runs true and smooth. Jig and instructions **$2.95** postpaid. Free literature.

SHARPEN YOUR CIRCULAR SAWS



The RIGHT WAY on your own saw table. Sharpens rip, cutoff, hollow ground and combination blades—6" to 10". Saws stay round with correct bevel. Precision made, easy to use, GUARANTEED. Only **$8.95.** Includes $3.00 Grinding wheel. "TRU-CIRCLE" saw set automatically sets teeth at 10° or more **$2.95.**

AT DEALERS OR POSTPAID

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Give him the tool *he* wants!

B&D Utility No. 44 Sander only $46.95

For the man who wants a Professional Sander

—Many *exclusive* features! Orbital motion insures a "satin-smooth" finish; 10 times faster than hand-sanding. Priced below comparable tools!

B&D Utility 5" Sander-Polisher only $32.95

For the man who wants a Tool of 1001 Uses

—Extra-powerful, extra-speedy. Comes *complete* with ¼" Jacobs drill chuck, sanding discs, polishing bonnet, rubber pad, wax, auto polish! Also grinds, sharpens, etc.

For the man who wants his First Power Tool

B&D Utility ¼" Electric Drill only $22.95

A handy, high-quality tool at a popular price! Drives many low-cost attachments to drill, sand, polish, grind, sharpen.

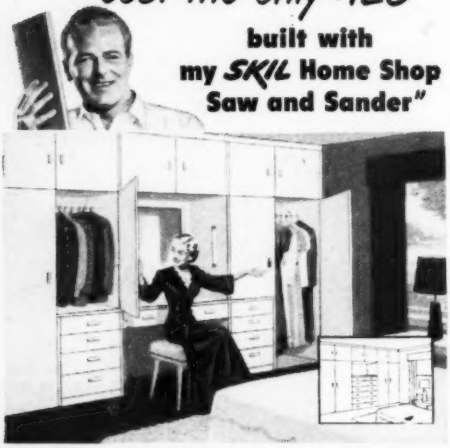
Bob Davis says: Whether you're giving a gift or buying for yourself, *choose the brand experts prefer* . . . BLACK & DECKER . . . and get a real tool, *not* a toy! WRITE TODAY for free book of job tips to: THE BLACK & DECKER MFG. CO., Dept. H12S Towson 4, Md.

Black & Decker

UTILITY TOOLS

PORTABLE ELECTRIC TOOLS

"This $435 wardrobe cost me only $123*



built with my SKIL Home Shop Saw and Sander"

I built this wardrobe *myself*, with SKIL Home Shop Tools. Saved $312 and had a wonderful time! SKIL Chart No. 111 showed me how to do it.

A SKIL Home Shop Saw and Saw Table makes fun out of jobs like this because it's simple to bevel, miter and rip even heavy lumber. All adjustments are simple and quick. And—the SKIL Sander smooths even the roughest lumber. Light weight and perfectly balanced with plenty of reserve power.

Whether *you* choose to build a new wardrobe or any other project, SKIL Home Shop Tools quickly pay for themselves. What's more—there's *nothing* to match your feeling of accomplishment. Send 10¢ and coupon below—now—for complete instructions.

SKIL Deluxe Home Shop Saw—Model 586. $59.50. 6" saw. SKIL Saw table and accessories easily convert this saw to tilting arbor bench saw, sander and shaper.

SKIL Home Shop Belt Sanders $68.00

*Price includes materials only, and varies locally. Tool prices subject to change without notice.

SKIL HOME SHOP TOOLS

Made only by SKIL Corporation, *formerly SKILSAW, Inc.*
5033 Elston Avenue, Chicago 30, Ill.
In Canada: Skiltools, Ltd., 3601 Dundas Street West, Toronto 9, Ont.

SKIL Corporation, Dept. D-122
5033 Elston Ave., Chicago 30, Ill.
I enclose 10¢. Please send SKIL Chart No. 111 showing how to build the above built-in wardrobe.

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Teacher Shouldn't Be Tough on Learners—Too Soon

How do kind or harsh words from an instructor affect a man's success in learning a task? And what happens if he believes that little, or much, depends upon his making a good showing?

Two Johns Hopkins psychologists, Drs. Richard S. Lazarus and James E. Deese, learned interesting answers to these questions from coordination tests they gave last summer to four groups of enlistees at Lackland Air Base, Tex.

Their findings indicate that a tough, blustering top sergeant or a bullying factory foreman can be bad medicine for a man trying to learn a skill. But once the novice has learned his task, a few harsh words may actually improve his performance.

Members of the first group were asked to take the test simply as a favor to the scientists. Otherwise their scores were of no importance, and would not appear on Air Force records, they were told. Treated casually, they performed well.

The second group's members were told that the test was extremely important, and that their whole military careers hinged upon how well they did. At first these men were flustered. But they soon caught up with the first group, and results were about the same.

Third Group Gets the Treatment

Likewise, members of the third group were led to believe that the test was very important. In addition, early in the test, the psychologists heckled them with such remarks as "You're a flop, soldier," or "I've never seen such rotten coordination." Their performance was comparatively poor.

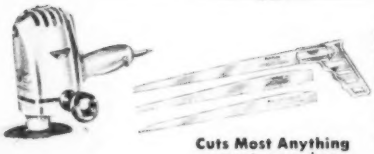
"We apparently impaired their learning of the task and they never recovered during the 50 tries allowed," Dr. Lazarus says. This could mean that a green recruit, given a bawling out during his first target practice, might have trouble ever becoming an expert marksman.

The fourth test group received exactly the same treatment as the third—except that the psychologists' unkind comments came late in the test. Surprisingly, this group performed better than all the others. "By the time we started badgering these men," says Dr. Lazarus, "they had practically mastered the task, and our sarcasm seemed to give them an extra push."

GIVE and get MILLERS FALLS TOOLS THIS CHRISTMAS

A basic tool for every handyman. Millers Falls No. 77A Hand Drill. $3.30

A beautiful new tool with unbreakable glossy red "Tenite" head and handle. No. 1950 Bit Brace. $4.80



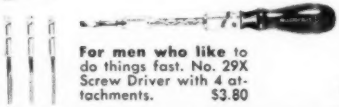
Cuts Most Anything — most anywhere. Millers Falls No. 725 "Nest of Saws." $2.95

Makes light work of hundreds of jobs. Millers Falls amazing new No. 966 Sander-Polisher. $37.50

A tradition among fine planes. Millers Falls No. 14 Jack Plane. $8.30

Passport to fun and a profitable hobby. Millers Falls No. 106 Carving Tool Set. $4.60

Handiest way ever to bore small holes. No. 100 Automatic Drill. $4.00



For men who like to do things fast. No. 29X Screw Driver with 4 attachments. $3.80

At hardware stores everywhere, you'll find these and many other fine Millers Falls tools in colorful Christmas boxes. They're perfect gifts for the men and boys on your list. Wonderful, too, to receive yourself. Pick out the ones you'd like and drop a hint to your family. They'll appreciate the tip. Free circular on request.

**Prices slightly higher in the West*

MILLERS FALLS COMPANY
Greenfield, Mass.

MILLERS FALLS TOOLS
SINCE 1868

The Mark of Superiority

How A Clean Carburetor Aids Quick Starting In Cold Weather

An old problem now licked by cleaning carburetor right on the engine

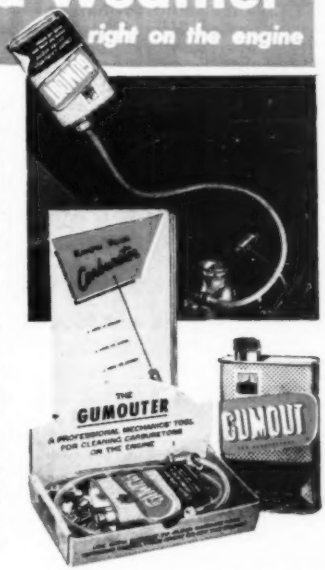
Engine experts blame many mysterious cold-weather starting troubles on the tiny speck of dirt or film that cuts carburetor efficiency.

If your car is hard to start in cold weather—even though the starter spins the engine fast enough and spark plugs and points are right—you should suspect dirt in the carburetor.

Fortunately, the carburetor today can be cleaned of all dirt, muck, moisture, gum and varnish in less than 20 minutes without removing the carburetor from the engine. You merely disconnect the fuel line; use an inexpensive "applicator" to feed GUMOUT—a special cleaner—into the carburetor; then reconnect the fuel line.

"Clean the carburetor *first*" is the sensible approach to curing not only cold-weather starting problems but any case of poor engine performance. Frequently, this quick, inexpensive job will save much of the time and money often wasted in checking timing, adjusting spark plugs, replacing points—even making major repairs—in an effort to correct trouble actually caused by a dirty carburetor.

Pennsylvania Refining Company, 2689 Lisbon Road, Cleveland 4, Ohio has prepared a helpful *Carburetor Handbook*, which you can get free by writing the company. This firm markets the new carburetor cleaner under the name of GUMOUT. It sells for $1.50 a pint at most dealers. The applicator, called the GUMOUTER, sells for $4.75.



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Save on Everything in TV & Radio!

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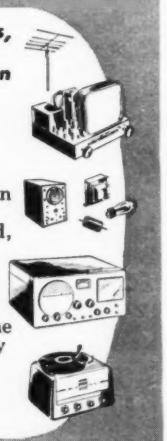

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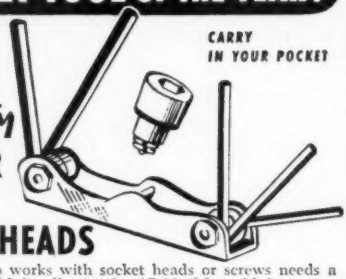

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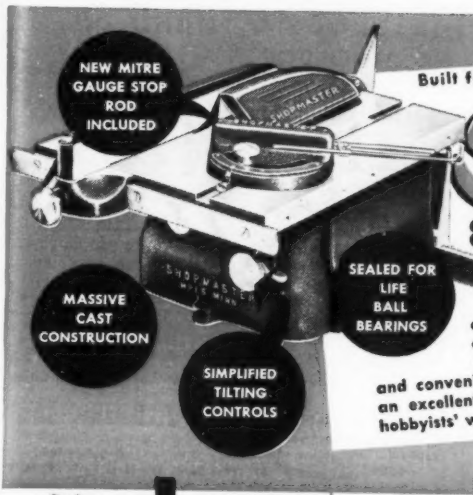

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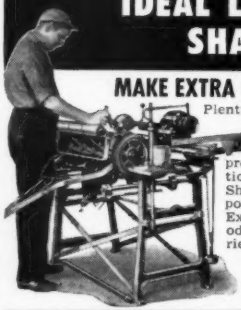

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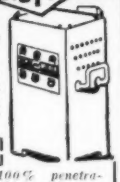

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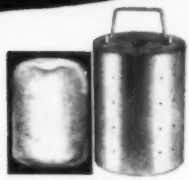

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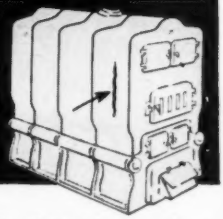

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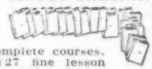

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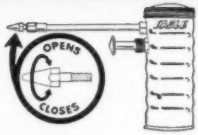
"66" BRASS OILER
WITH NEW SHUT-OFF SPOUT TIP!



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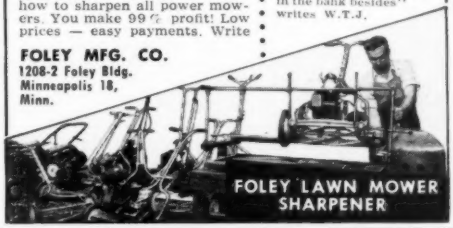

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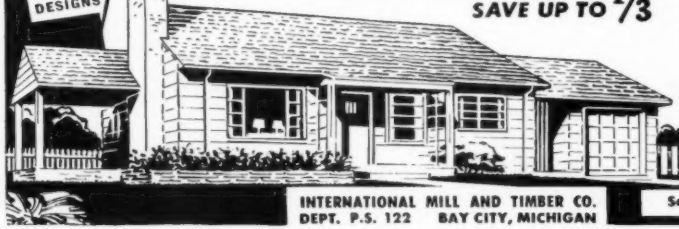

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Top performance for forced draft, ventilating, exhausting, cooling, drying. 110v. AC.

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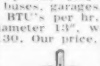
Double reduction, reduces 1/6 to 1/2 HP electric motor's 1750 rpm to 22 rpm. Reg. $45.00, NOW . . . **$22.00**



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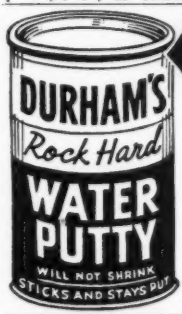

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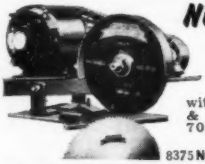

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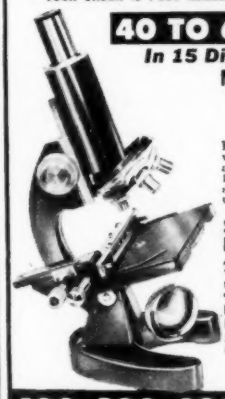

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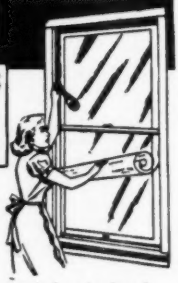

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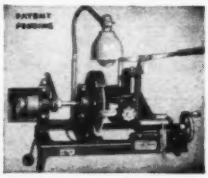

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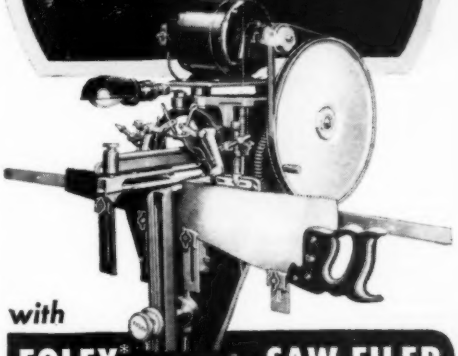

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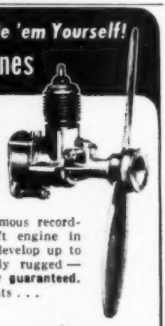

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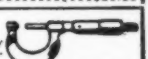

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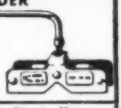

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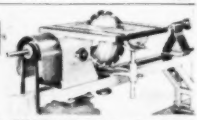

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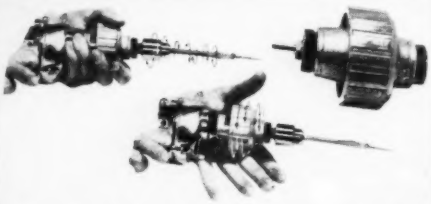

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Suitable for the architect, student, draftsman, artist etc. Contains 9 separate pieces including: one 5¼" compass with pen & pencil parts; one 5¼" divider; one each - 3½" bow divider, bow pencil & bow pen with wheel adjustment & reversible needle point; one 4¼" ruling pen with extra handle; capsule of extra leads. All in a 2 flap, velvet lined pocket book case. **5.98**

FAMOUS RICOHFLEX VI CAMERA

10 DAY FREE TRIAL—MONEY BACK GUARANTEE

RECOMMENDED AS A TREMENDOUS "BUY" by a leading independent research firm. Produces results comparable to most expensive reflex cameras. Foolproof to operate. Has all-metal body — leather covered. 80mm precision matched f:3.5 color corrected, coated lenses. Built-in wide field magnifier. ASA synchronized shutter. Speeds: 1/25, 1/50, 1/100 and B. Reflex focusing. Built-in flash synchronization for all standard equipment. Takes 12 exposures, 2¼" x 2¼", on 120 film. *Price includes genuine leather case with "snap-off" front.*

ONLY 38.50

RADIO MIX

A veritable "TREASURE CHEST" for "ham" operators and experimenters. Contains: Headset, Mike Button, Trans. Wire, Insulators, Switches, Condensers, Rheostats, Terminals, Jump Cable, etc. Approx. 8 packed lbs. for ONLY - **2.49**

USAF THROAT MICROPHONE

Genuine USAF type T-30-D. Gives distinct voice reproduction for aircraft or amateur radio broadcasting. Consists of two microphones, mounted on rubber neckpiece elastic neck band. Operates between 100 & 300 ohms . . . **1.39**

NEW POCKET HAND WARMER

The perfect GIFT for Servicemen, Family or Friends. Will maintain temperature of 120° from 16-24 hours by radiation. Uses pocket warmer fluid, lighter fluid or white gas as fuel. Metal Chrome finish with velvet pouch. For Hunter, Skier, Fisherman, etc. **2.25**

GENUINE ARMY TYPE PARKA

A BARGAIN for those who want the BEST! Same design as used by troops in Korea. Made of durable, waterproof, windproof, heavy duty Poplin. Has a snap-in inner lining of soft fleece for that extra warmth in the coldest weather. Front has 3/4 length zipper closure with button-down outer storm flap. Hood gives complete protection to head. Body has two deep slash pockets and two side pockets all with button-down storm flaps. Sleeves have inner knit wrist bands. Web belt gives a snug fit. Color: Olive green. Sizes: Small, med., large. Small size is ideal for the average woman. Stocks limited—Order TODAY! **34.95**

AIR CORPS TYPE RED HUNTER PARKA

A REAL HUNTER'S FRIEND! You'll "play safe" in this top quality, Hunter's RED Parka. Same design as the Air Corps B-9 Parkas. Outside is fine count, windproof, water repellent poplin. Inside is quilted sateen with 100% wool innerlining. Has 2 deep slash pockets and 2 side pockets—all with storm flaps. Front has full zipper closure with inner storm flap. DUCK and DEER HUNTERS are PRAISING THIS GARMENT. Sizes: Small, medium, large. **18.95**

100-200-300 POWER MICROSCOPE

A VALUE UNSURPASSED ANYWHERE! Has a triple objective revolving turret. Extra fine micro adjustment. Adjustable plano substage mirror. Body inclinable through 90° for microprojection in dovetail hardwood case. **13.95**

600 POWER MICROSCOPE

Has all the features needed for the finest work. Comes with 3 eyepieces (5x, 10x, 15x). Triple revolving turret has 4x, 10x, 40x achromatic objective lenses. Gives power combinations from 20x to 600x. Also has a square 90 degree inclination stage. Two-side plano & concave substage mirrors. Solid base, precision construction. A regular $150. Value. OUR PRICE complete with fitted hardwood case. **74.95**

MICROPHONE

Popular telephone type, highly sensitive. Has excellent, clear tone. This was the Signal Corps favorite. An ideal instrument for the Radio "Ham" and professional recording studio, for broadcasting, home recording, public address systems, etc. Comes complete with cord & plug. **3.29**

SIGNAL CORPS TEL. KEY

The new model J5A with ball type, flame-proof, metal key, perfectly balanced to permit positive contact with minimum effort. An ideal instrument for "ham" or professional use. A BUY at . . NEW **1.89**

AIR CORPS TYPE LEATHER CAP

Special! For Hunter, Camper, Farmer. All leather with soft, warm sheepskin lining. Has turn-down flap for ear protection. Leather covered long visor. Sizes: Small, med., lg. **2.59**

MITTENS

Sheepskin lined. Leather outer cover. Ideal for all types of winter work. Small, med., large. . . . **2.69 PR.**

GENUINE ARMY SKI PATROL PARKA

NEW

Made of heavy, white duck. Wind and water resistant. Slip-over type with draw strings on cuffs and around waist and hood. Neck has 4 tie straps for adjustment. Body is finger-tip length with 2 large outer pockets. Designed to be easily worn over other clothes. Ideal weather protection for the outdoor sportsman, hunter, . . . **2.49**

50 POWER POCKET MICROSCOPE

A Palley Bargain! Has extremely sharp 50 power magnification. Compact, slips into pocket. 4 lens compound optical system. Now examine insects, stamps, minerals, gems, etc. Comes ready to use. **3.49**

ALNICO SPEAKER

Permanent magnet type. 4" diameter. 2 wire hookup. Ideal for small radios, inter-com systems, test equipment etc. NEW **2.49**

20 POWER TELESCOPE

Top quality import. Coated Lenses. Bright, clear image & wide field of view. **8.95**

SURPLUS JEEP CANS

FOR RESERVE GAS SUPPLY - Holds 5 GAL. Has screw top and will take standard flexible nozzle . ONLY . . . . . **1.39 EA.**
FLEXIBLE NOZZLE . . . . . .49¢

AIR CORPS TYPE Sheeplined BOOTS

A REAL BARGAIN! All NEW. 100% waterproof and designed to be worn with or without shoes. Lined throughout, including tongue, with soft fleece sheepskin. Water repellent leather uppers with waterproof rubber lowers. Heavy non-skid tread on soles. Full zipper closure. Height approx. 12". Sizes: small, med., large. **13.95**

"BLUE BUNNY" FLYING SUIT

For winter sports, hunting or "bundling". As coveralls for cold outdoor or farm work. It is 100% woven wool with an extra flannel inner lining for double warmth and utility. Has wiring so fine, flexible, it does not interfere with movements. Can be used with or without heating or can be plugged into car, tractor or truck battery. Sizes: 36 thru 44. **4.95**

EYE LOUPES 99¢

An indispensable aid in fine inspection work. Available in 2½, 2¾, 3¼, 4 & 5 power. . . . each

ELECTRIC MOTORS

606 - DELCO MOTOR

1/50 HP, 24v DC, 1.6 amp. turns 3000 RPM. Has adj. overspeed contactor to stabilize and control speed. Length 5½". Diam. 3". ONLY **4.95**

NEW! HY-SCORE .177 CAL. AIR PISTOL

Recommended by General J.S. Hatcher in April '52 issue of American Rifleman. No pumping necessary—just cock and fire. Has ALL STEEL rifled barrel, 7-3/4" long. Gives higher muzzle velocity than any other Air gun. Shoots .177 caliber pellets or darts. Ideal for use in shooting small game or targets. Also available in 22 cal. or BB. Write for information on other models. **14.95**

MAKE YOUR OWN POWER UNIT

Complete Unit

Here's a unit PACKED WITH BRUTE FORCE! Does all those hard, heavy jobs that ordinary power tools cannot handle. Easily made from a vacuum cleaner type motor, a gear reduction drive and a few homemade parts. Can be used for turning large nuts & bolts, digging post holes, drilling large holes in wood or metal, driving power tools & machinery, lifting, pulling, pushing, and any job where a slow speed with high torque is required. YOU CAN'T STALL IT! Lightweight, easy to handle. Has 1000's of uses in home, garage, shop, factory. We supply complete instructions.

MOTOR **3.25**

GEAR BOX NEW 12.95 USED 6.25

SAMSELL MOTOR

27 volts, 16 amps, 1/5 H.P. reversible, series wound armature. 3800 RPM, shaft 9/32" diameter. 12-spline. 4-1/8" x 2-3/8". NEW ONLY **3.95**

SURPLUS MOTORS

No. 500 - Used 1/2 HP - 27 volt, DC-AC. This motor can be readily adapted to deliver up to 1/2 HP on 110 volts AC by the simple method of rearranging armature brush-leads. Free Diagram with each order. A SENSATIONAL VALUE **5.95**

4 TAKE-OFF DRIVE UNIT

Has many uses where 1 to 4 different take-offs are needed. All four drives turn in unison from the common power input. Drive is adaptable to use with 9/32" flexible drive shafts & accessories. **3.75**

MARCHING COMPASS

Officer's type with prismatic hair-line guide for sighting at distant objects and at the same time reading degree of setting. Accurate & dependable. Has jewel mounted needle and luminous dial for night use. **3.95**

NAVY Sealed Beam SPOT LAMP

U.S. NAVY Portable Search-spot light. Has pistol grip & aiming sight. Makes an ideal search, spot or emergency for auto, boat, camp, etc.

12 Volt light - 4" lens . . . **4.29**

24 Volt light - 5" lens . . . **4.79**

230 PAGE CATALOG

1000's of ITEMS Fully ILLUSTRATED! For the MECHANIC, SPORTSMAN, HOBBYIST, HOME OWNER, etc.

War Surplus — Factory Closeouts and General Merchandise Values! Save on Hardware, Hand & Power Tools, Gadgets, Sports Equipment, Hydraulics, etc. SEND 25¢ for HANDLING & MAILING.

PALLEY SUPPLY CO.

2263 EAST VERNON AVENUE DEPT. PS-32 LOS ANGELES 58, CALIF.

Order From This Ad. Pay by M.O. or check. P.O's. accptd. from D&B firms. ½ deposit with C.O.D's. All Prices FOB Los Angeles.

Riding America's Biggest Mail Train

[Continued from page 85]

was the uncanny knowledge of geography and postal routes which is the stock in trade of every letter clerk. Each of No. 14's three RPO cars was a separate operating entity, with its own staff of specially qualified men. This car, for example, handled only New York City mail. The one behind it—they call it the "Ma and Pa"—was mainly for Massachusetts and Pennsylvania sorting, and the RPO'er ahead took care of the New York State material.

In order to qualify for one of the "state" cars, a clerk had to know rail and truck routings for mail addressed to as many as 1,200 towns. Without that information, it would be impossible to work the 84 pigeonholes in front of him at the required rate of 30 letters a minute. In the "City" car, street numbers and postal zones take the place of towns and routes, with an interesting complication thrown in. Many New York streets extend through two or more zones and a clerk must be familiar with all of the number breaks.

Jokers Keep Them Jumping

"There are a lot of jokers who still think it's funny to write a cute address," Lavis remarked. "They draw a picture of a column, a bus and a loop. We're supposed to know that's Columbus Circle. Back in the Massachusetts car, Claude Miller got a letter a couple of years ago that really had him stumped. There were only three words on the envelope. The top one was 'Wood,' the middle one 'John,' and the bottom one 'Mass.' Ordinarily we don't beat our brains out on a puzzler like that. But Claude kept kicking those words around and he finally came up with the answer. It was John *Under*wood, *Andover*, Mass."

"Tell him about the 'nixies,'" a clerk called from across the aisle.

Lavis pointed to a special pigeonhole at the top of his case. Already it was more than half-full.

"These nixies," he said, "are misaddressed letters and cards. If you were to run through them you'd find that nine-tenths of the mistakes are the result of carelessness. A fellow in Salt Lake City writes to a New York business house. He's doing fine until he gets around to the state address. Then, from force of habit, he scrawls 'Utah.'"

"How about this Christmas mail? In the last-minute rush I suppose you get a lot of nixies?"

"No," he said. "As a matter of fact the ratio is considerably lower. I'd lay that to the fact that most Christmas mail is addressed from those little notebook lists that most people keep, so they aren't relying on faulty memories and aren't as apt to make mistakes."

Morale Is High

"Funny thing about this service," said Lavis, as he was getting into his street clothes at the end of the run in Cleveland. "It gets in your blood. For the first couple of years it's so tough you're ready to quit at the drop of a registered letter. But you don't. And then pretty soon you find yourself with a noggin full of interesting information that you couldn't use in any other business. You begin to take a personal pride in your test marks, and the steady rate of advancement. Even your feet become so used to carrying you around all day that you're sure a job at a desk would knock you out.

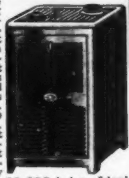
"It's that way from the top of the service to the bottom. We've all been through the same mill, and officials like Clarke and Grose, in the Chicago office, could step right into this car today and work a case with the best of us. They know our problems and are pulling for us. Sure hope you can write up something that will put the general public in the same frame of mind." END

Lend Lease

SIGN in warehouse: "Hereafter all strapping tools may be borrowed on LEND-LEASE basis. If we LEND them to you, the LEASE you can do is bring them back."—*Corning Gaffer.*

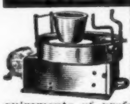
GET BEDROCK FACTORY PRICES SAVE TO 85% ON GIFTS

CIRCULATING OIL HEATER



(Item 77) Circulating Heater. Modern, attractive cabinet heater **with built-in powerful, silent fan.** Heats floors and all rooms evenly. Dim. 19 x 17 x 30 in. 7 in. Breeze pot and economizer heat baffle utilizes every bit of heat. 30,000 b.t.u. Ideal for 2-3 rooms, trailers, cottages, etc. Lifetime aluminum cabinet, built-in oil tank. Detroit inlet valve easily connected to outdoor tank if desired. Highest quality. Underwriters Lab. approved. Wt. 60 lbs. Built to sell for $89.00
Sale price........ **$39.50**

POTTER'S WHEEL



Power Driven — Foot pedal speed control

New compact modern design. Precision built to meet exacting requirements of professional artists—the finest wheel ever built. Mechanism fully enclosed for safety and to exclude moisture and clay. Foot-controlled variable speed drive provides instant, smooth speed range of 30 to 150 rpm. Equipped with adjustable arm rests. Easy to operate—even for handicapped persons. Reversible 10" throwing head — back side recessed for casting plaster bats. Larger **18x 18"** throwing table; wedging wire attached; removable water cup inside. Heavy bronze bearings pre-lubricated, sturdily built for long, dependable service. Use ¼ hp motor (not incl.). Shipped fully assembled — just mount wheel and motor on table or sheet of ¾" plywood. Self storing—tip up on edge. Wt. 45 lbs. List price $125.00. Factory special............ **$64.50**

¼ HP 115 V. A.C. Motor for Potter's Wheel, wt. 27 lbs. (Item 258)... **$15.00**

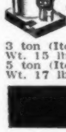
32 Pc. SOCKET SET

32-pc. Socket Set (Item 59) Highest quality guar. non-breakable sockets made by Husky. Beautiful, matched chrome alloy, absolutely the best. Complete range of 21 sockets from ¼"thru 7/16" in ¼" drive and 7/16" thru 1-1/16" in ½" drive; 2 extensions, reversible ½" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, ¼" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. Easily worth $41.50. While they last only........ **$16.95**

45 Pc. SOCKET SET

(Item 205) Contains a complete set of sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List price $62.90. Factory Special...... **$26.95**

HYDRAULIC JACKS



(Item 208) Heavy duty, precision built, smooth, positive acting with built-in relief valve. Hi-Lift with screw extensions. Govt. surplus at a fraction of orig. cost. (Handle included.)

1½ ton (Item 208) Wt. 11 lbs..... **$6.45**
3 ton (Item 208A) Wt. 15 lbs........... **$9.45**
5 ton (Item 208B) Wt. 17 lbs.......... **$11.45**

ELECTRICAL VALUES YOU CAN'T MISS!

HI-LINE 6000 WATT PLANT

(Item 162) **Push Button Start,** 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995.00. **With self starter.** Factory price... **$645.00**

Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price. **$345.00**

HEAVY DUTY D-C ARC WELDER

(Item 38)

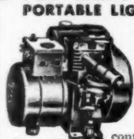
Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. $400 value at........... **$99.75**

DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Spec.. **$119.50**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at....... **$10.50**

Write for prices and information on A.C. Arc Welders.

PORTABLE LIGHT PLANTS



(Item 24)

350 watts—115 v. D.C. powered by a sturdy, easy-starting 1½ hp. Briggs engine, perfect for lights, radios, razors, etc. in cabins or trailers. Use standard light bulbs. Built-in control box with receptacle — just plug in. Weighs only 65 lbs. Item 273. Reg. price $199.50. A terrific value at........ **$99.75**

PUSH BUTTON START A.C. PLANT 500-700 watts—115 v.—60 cyc. A.C. Powered by a rugged 2 hp. easy-starting Briggs gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Item 24. Wt. 85 lbs. Fully Guaranteed. **Be Prepared if war or storm knocks out power lines.** Reg. $275 value....... **$143.50**

700-800 Watt Plant (Item 44) same as Item 24 but larger engine.......... **$169.95**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine... **$199.50**

GIANT 2000-2500 WATT PLANT

(Item 31)

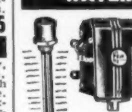
110-120 V. 60 cyc. A.C. **Absolutely the best made** — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and complete instructions included. Wt. 220 lbs. Reg. price $585.00. Special at.... **$299.50**

79 Pc. CARPENTER'S TOOL SET

Professional quality. A complete set of Master Mechanic tools featuring the famous **Stanley** brand. All neatly arranged in a beautiful sturdy 32" hvy. steel tool box. Set includes: Powerful ¼" Electric Drill (optional), 3 Stanley Wood Chisels 29" Spring Steel Saw, Steel Bench Vise, Tin Shears, 9 Drill Bits, Sharpening Stone, 8" Plane, 24" Stanley Level, Hacksaw, Stanley Rule, 5 Double End Wrenches, 13 Asst'd. Hacksaw Blades, Stanley Hand Drill, 10" Vise Wrench, Comb. Square, Stanley Hammer, Stanley Ratchet Brace, Coping Saw, 7 Coping Saw Blades, Steel Wrecking Bar, 4 Screw Drivers, Offset Screw Driver, Nail Set, 4 Asst'd. Files, 8 Pc. Allen Wrench Set, Auger Bit Set and many other tools. Worth at least $150.00 if purchased separately. Save cost of tools on one or two jobs. A terrific value.

Item 242. Wt. 41 lbs. (without Electric Drill).... **$39.50**
Item 242A. Wt. 45 lbs. (incl. Electric Drill)...... **$49.50**
TOOL BOX ONLY—Wt. 15 lbs. (Item 243)........................ **$8.95**

Automatic Electric WATER HEATER



(Item 76) Immersion type 115 v. AC — 1250 watts. Convert your present tank to modern automatic hot water heater. Long life Westinghouse or Chromalox element screws into std. 1¼ in. opening in tank. Adjustable thermostat keeps water at desired temp. Can also be used in washing machine or tub. Wt. 8 lbs. Heater element and thermostat regularly $49.50. Special.......... **$14.95**

Heater only, for manual temperature control, Wt. 3 lbs........... **$7.95**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 v. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lbs., **$6.85**; 9" Fan, wt. 6 lbs. **$7.85**; 10" Fan, wt. 7 lbs. **$8.85**; 12" Fan, wt. 8 lbs. **$9.85**.

Heavy-duty 12" fan, enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, and other difficult applications. Wt. 12 lbs. Item 10D................ **$12.95**

MASTER SNOW BLOW

No Pushing — Self-Propelled

It's a lawn mower
It's a power sickle
It's a cultivator
It's a plow
It's a bulldozer
It's a rotary tiller

(Item 206)

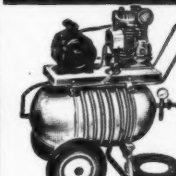
Here at last is a powerunit that does everything. Works for you year 'round. Does terrific job of clearing snow. Built-in power takeoff to drive pumps, saws, generators, etc. Safety clutch—can't burn out. More versatile and efficient than tractors costing twice as much. Basic self propelled 2 hp. tractor—Briggs or Clinton engine. Only **$119.50**

Tractor shown with snow blow attachment.

Snow Blow.......... **$29.50**
Lawn Mower Hitch..... **$4.50**
Cultivator........... **$8.75**
Rotary Tiller......... **$42.50**
Sickle Bar-Mower..... **$42.50**
Bulldozer............ **$11.25**

Freight prepaid to most areas. Easy payment plan available.

MASTER AIR COMPRESSOR

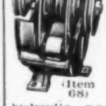


(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12"x24", 2100 cu. in. cap. Safe up to 500 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Low factory prices.

With ⅓ hp. 110 v. A.C. motor (Reg. $175.00) (Item 209).......... **$98.50**
With ½ hp. motor (Reg. $199.50) (Item 209A)...... **$119.50**
With 2 hp. Briggs Gas Engine (Reg. $199.50) (Item 209B)....... **$109.50**

Write for price of compressor only. A complete line of spray guns and air tanks available.

Variable Speed Selector



(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists — any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation (data included). 3 sizes: ½-1 hp. wt. 36 lbs.; 1-2 hp. wt. 53 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Our prices . . . **$79.50, $89.50** and **$114.50.**

Factory Prices on Catalog Items

Send 10c for **BIG 1953** catalog. Hundreds of bargains

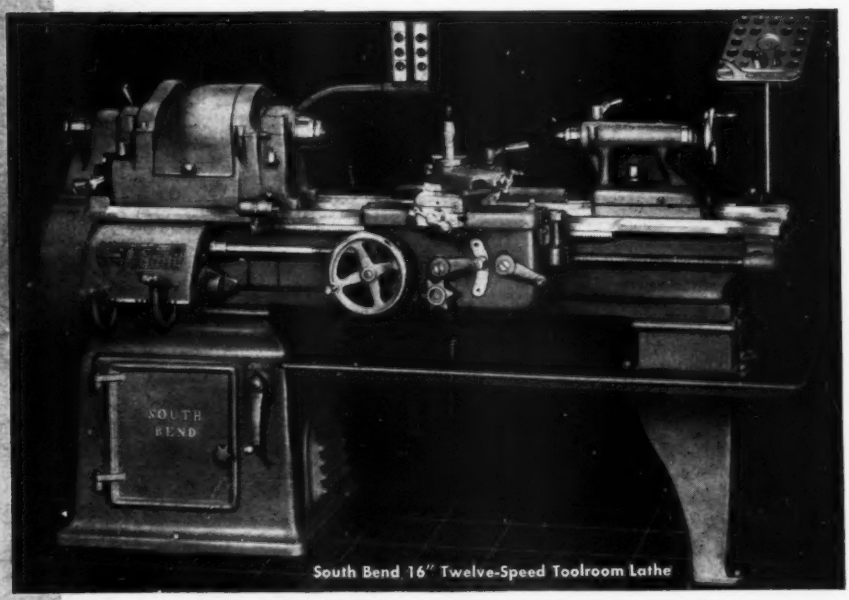
Prices f.o.b. Factory. 10 day Money back guarantee. Send check or Money Order

MASTER MECHANIC MFG. CO., DEPT. 58-B Burlington, Wis.

Cuts Machining Time

SOUTH BEND 12 SPEED LATHE

The wide range of spindle speeds on this new lathe cuts machining time because the operator quickly selects the right speed for each operation. Push-button control provides a fast change from any high speed to the corresponding low speed. This versatility is further increased by 48 choices of longitudinal and cross feeds which insure maximum efficiency on every job. Also, you will find that its accuracy and ease of operation make your tough jobs easy. Send the coupon for complete information about this new lathe.



South Bend 16" Twelve-Speed Toolroom Lathe

SPECIFICATIONS

Spindle Speeds (approx.) Direct: high range 300, 550, 945; low range 150, 278, 475. Back gear drive: High range 32, 70, 118; low range 20, 33, 60.
Spindle Bore — 1⅜".
Swing over bed and saddle wings — 16¼".
Swing over saddle cross slide — 9⅝".
Distance between centers — 33¼", 45¼", 57¼", 81¼", 105¼".
Collet Capacity — 1" maximum.
Longitudinal Feeds — 48 R.H. or L.H., .0015" to .0841".
Cross Feeds — 48, .0006" to .0315".
Thread Pitches — 48, 4 to 224 per inch.

SEND INFORMATION CHECKED:

☐ _____
☐ TOOLS & ATTACHMENTS
☐ 9" and 10" BENCH LATHES
☐ 10" to 16-24" FLOOR LATHES
☐ ½" and 1" Collet TURRET LATHES
☐ 14" DRILL PRESSES
☐ 7" BENCH SHAPERS

Name _____ Company _____
Street _____ City & State _____

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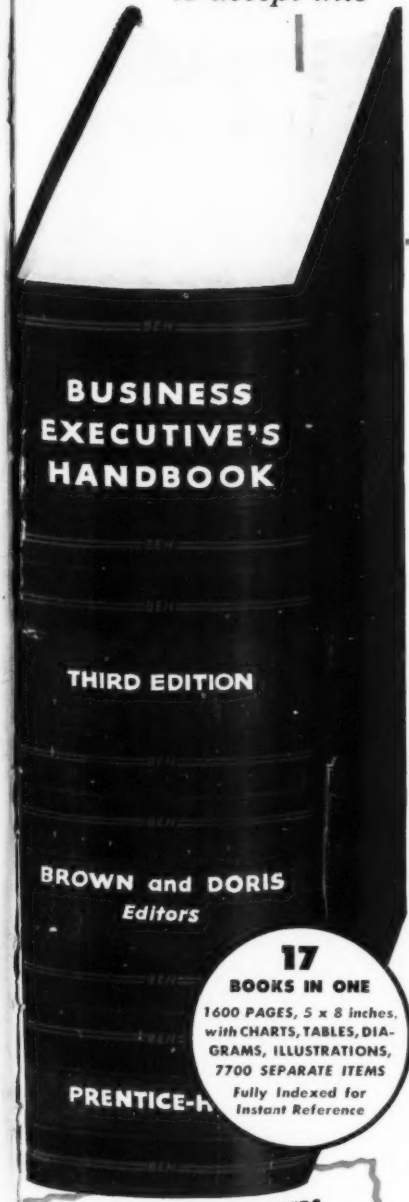

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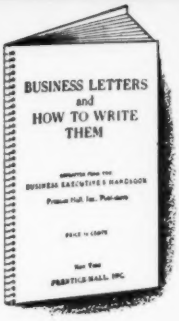

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